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INDIAN AGRICULTURAL
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Vol. XLII. Part 1.

JANUARY 1,

THE

AGRICULTURAL GAZETTE

OF

NEW SOUTH WALES.

Issued by Direction of

The Hon. W. F. DUNN, M.L.A.,

MINISTER OF AGRICULTURE.

K. SYNNOTT, *Editor.*

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1st January, 1931.

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VOL. XLII. PART 1. JANUARY 1, 1931.

Agricultural Gazette of New South Wales.

Wheat Crop-growing Competitions.

EXTRACTS FROM THE JUDGES' REPORTS.

The Middle West.

G. NICHOLSON, H.D.A., Senior Agricultural Instructor.

THE following agricultural associations in the Middle West conducted wheat-crop competitions in 1930:—Baradine (fifteen entries); Coonabarabran (twenty-seven entries); Binnaway (twenty-four entries); Molong (ten entries); and Cudal (fifteen entries). The Mendooran P. and A. Association conducted a pure-seed plot competition which attracted thirty entries, and in which judging was carried out on similar lines to the larger competitions. The object of the competition was twofold, (1) to encourage the wider use of pure seed and (2) to augment the funds of the Association. The seed was supplied free to approved farmers and half the product of the plots or its equivalent in f.a.q. wheat was returned to the Association.

The Season.

For the early part of the fallow period no beneficial subsoil-soaking rains were recorded. A welcome break occurred late in December and early January, and provided suitable conditions for the cultivation of the fallow and the proparation of short summer fallow. A dry spell in February was followed by favourable rain during March.

The growing period commenced with a dry April, and except for sowings made early in the month the germination generally was unsatisfactory until May. A general and definite change occurred early in June, when the entire district received a thorough soaking and this was followed by further good rains in July. August and September rains were patchy and by the end of the latter month crop prospects had commenced to decline. Fortunately excellent rains fell early in October, which definitely relieved any deficiency of moisture, but at the same time encouraged the spread of disease. Mild, moist weather and the absence of heavy frosts during June and July resulted in rapid rank growth and predisposed the crops to frost damage, disease, and lodging. Very forward crops or those sown too early and out of season were unable to withstand the dry, cold, unfavourable conditions prevailing in September. Of these, some were badly frosted whilst others partially died back. Though the total rainfall for the growing period was sufficient, the season cannot be regarded as wholly satisfactory, due principally to the prevailing climatic conditions. Early crops suffered from frost damage and late crops hayed off and matured only a pinched inferior sample of grain.

RAINFALL Records.

	Baradine	Coonabarabran	Binnaway	Molong	Cudal
	Points	Points.	Points.	Points.	Points.
Fallow Period.					
January	322	160	200	263	60
February	30	17	63	76	75
March	333	174	182	156	295
Total	685	351	445	495	430
Growing Period (April to October, 1930).					
April	56	52	65	113	80
May...	111	103	104	150	166
June	534	546	436	404	190
July	251	313	302	294	225
August	183	225	87	133	245
September	90	52	60	10	55
October	370	340	365	425	396
Total	1,598	1,631	1,419	1,529	1,357

Varieties.

Eighteen varieties came under review, and of these the most popular were Waratah 25.3 per cent., Nabawa 16 per cent., Turvey 14.2 per cent., Yandilla King 9.4 per cent., Marshall's No. 3, Canberra and Cleveland each 6 per cent. A number of other varieties, including Velvet, College Purple, and Hard Federation, could with advantage be discarded in favour of the abovementioned varieties.

The following table gives the placing of the varieties:—

—	Number of Entries	Number of Placings			
		First	Second	Third	Total
Yandilla King ...	8½	1	2	..	3
Nabawa	11½	1	...	2	3
Waratah	23	1	1	1	3
Turvey	13	2	...	...	2
Cleveland	5½	...	1	...	1
Marshall's No. 3 ...	5½	...	1	1	2
Canberra	5½	...	...	1	1

The outstanding varieties this season have again been Nabawa and Waratah and these have given excellent results throughout all parts of the district. Yandilla King, Marshall's No. 3, and Turvey, which are rust-liable, have been successful principally in districts which were not seriously affected by rust. In former years Nabawa has proved to be resistant to drought and flag smut, and this season it has proved to be equally suited to moist conditions, and it also exhibits a greater resistance to rust than any of the other varieties under review. It therefore must now rank as the most reliable mid-season variety grown. Waratah, by reason of having a high resistance to rust, will regain some of its lost popularity. This variety, even though at times carrying a fair percentage of rust, appears to have the capacity to mature a normal sample of grain. Of the other varieties Currawa and Cleveland are not readily susceptible to rust. Yandilla King, Turvey, Marshall's No. 3, Penny, Velvet, Purple Straw, and the Federation strains have proved to be highly susceptible to rust attack.

Trueness to Type and Purity.

There is considerable room for improvement in the type and purity of the seed sown. This applies particularly to the northern section of the district, where frequently seed is saved from crops grown on stubble land. As volunteer plants will often occur under these conditions, it is impossible to produce a good type of seed. Of the ninety-one blocks, thirty only conformed with the pure seed standard, thirty-five were of fair quality containing a light sprinkling of strangers, and twenty-six were inferior, being badly mixed and off type.

Rate of Seeding.

As shown in the following table most sowings were made with a moderate quantity of seed:—

RATE of Seeding.

Society	Maximum	Minimum	Average
	lb.	lb.	lb.
Baradine	58	43	50
Coonabarabran	60	39	50
Binnaway..	60	45	51
Molong	60	50	57
Cudal	70	45	62

Superphosphate.

Manuring is by no means universally favoured in the northern districts, and until such time as better cultural methods are practised, it is unlikely that any outstanding benefits will accrue from the application of superphosphate. At Purlewaugh, in the Coonabarabran district, Mr. F. Corderoy's crop, which was placed second, was grown on a light loam which had been fallowed along approved lines. It was manured with 56 lb. superphosphate, and for comparison a number of narrow strips were not manured. The difference in favour of the manured portion was most marked, this area being much denser and better headed. At Baradine only one crop, and this the winner, was manured (with 45 lb. superphosphate). The land had been short summer fallowed in December.

In the Coonabarabran competition four blocks were manured with an average of 48 lb. superphosphate. The crops placed second and third were manured and grown on fallow. At Binnaway eight crops received an average application of 48 lb. superposphate. Here also the crop placed third was grown on fallow and manured. The crops placed first at Coonabarabran, and first and second at Binnaway, were grown on fertile virgin country, and therefore are not comparable. At Molong all crops were manured, the quantity of superphosphate ranging from 40 lb. to 80 lb. with an average of 61 lb. One crop only was unmanured at Cudal, the quantities in the other entries ranging from 35 lb. to 70 lb., with an average of 56 lb.

Feeding-off.

It is seldom that late sowing will give satisfactory results, and this season has again proved the advisability of sowing in season. The greater number of very late maturing crops hayed off and produced a pinched and practically worthless sample of grain. Moreover, it has been observed that crops fed off until late in the season are almost a complete failure. Because of the mild weather and good rains early in the growing period, crops grew apace and it was advisable to feed off. Others were allowed to go until 12 to 18 inches high before being eaten back. These grew rapidly after the October rains, but as the straw growth was excessive and succulent they readily succumbed to the drying winds in November. Crops which at time of judging showed most promise and were maturing normally had either been fed off quickly during the early part of the season or had not been grazed.

Disease.

Flag smut is usually responsible for a greater reduction in yield than all other diseases combined. This season, however, with a few exceptions, the crops were singularly free from infection. Many crops were grazed until late in the season and it is probable that flag-smutted plants, due to weakened vigour, died back early as a result of the feeding off. Turvey and Canberra were the most susceptible varieties. Rust and foot-rot resulted in a serious reduction in yield and the quality of the grain also suffered. Comparatively little rust damage occurred in the Molong and Cudal districts. It has been observed that crops fed back until late in the season proved to be highly susceptible to foot-rot Frost damage and rust, by weakening the vitality of the plants, predisposed them to attack. No variety under review appears to be immune, and Turvey was highly susceptible. Eighty-nine competitors favoured the dry copper carbonate pickle and only two bluestone. With the exception of a crop of Penny all entries were apparently free from ball smut.

Cultivation.

With but a few exceptions, advanced systems of cultivation are not in vogue in the Baradine, Coonabarabran, and Binnaway districts. After a period of dry years, and with a favourable rainfall during the growing period, it was possible to produce fair crops under almost any system of cultivation, particularly on virgin land or land which has been cropped only two or three times. On older land, however, weed growth is prevalent, and if payable crops are to be produced it will be necessary to adopt better cultural methods.

It is not an uncommon practice to disc plough 4½ to 6 inches deep in April and May, and then, without any further workings, to sow with the drill or combine. If similar methods are followed in an average season, then the prospects of producing anything like a decent crop will be remote. The disc is still strongly in favour for the cultivation of the fallow. However, all the leading crops in these competitions were grown on land which had been cultivated only with tined implements. Of the crops grown on short summer fallows and exclusive of virgin land, the most promising were those which were sown on land that had been ploughed or scarified not deeper than 3½ inches.

Although the seasonal rains were favourable, the value of early ploughing was most marked. The following table shows the number of entries which were winter fallowed and short summer fallowed in each competition:—

TIME of Ploughing and Kind of Fallow.

Society.	Winter Fallow	Short Fallow.		
		January.	February	Late (March to June)
Baradine .	2	1	6	6
Coonabarabran ...	9	6	6	6
Binnaway	6	1	9	8
Molong	8	2	Nil	Nil
Cudal	13	2	,,	,,

Dubbo and Adjacent Districts.

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

The early promise of a record average yield from a record area under crop in this portion of the western district was spoilt by a dry spell during the latter part of August and throughout September, followed by the appearance of stem rust, which ruined many crops, more particularly the slow-maturing and usually heavy-yielding varieties such as Yandilla King, Turvey, Penny, &c., while late frosts did incalculable damage to many crops in every district. In addition, large numbers of army worms and a late infestation of grasshopper swarms added their quota to the lowering of crop yields. In spite of these set-backs, this portion of the west was able to provide the winner of the western districts championship competition conducted by the Royal Agricultural Society in the person of Mr. Evan Jones, "Iona," Narromine, while third place was gained by Mr. Peter Fallon, of Gilgandra, and Mr. C. G. Shaumer, "Geurie Homestead," Wellington, won second prize in the central western group.

Five P.A. and H. Associations again conducted crop competitions, with a total of fifty-seven entries, namely:—Cumnock (ten entries), Dubbo (five entries), Gilgandra (twelve entries), Narromine (twelve entries), Wellington (eighteen entries).

The Season.

Owing to the dry winter and spring of 1929, conditions were not favourable for the early preparation of fallows, and the initial ploughing was carried out under difficulties, or delayed until late spring rains occurred. Twenty-two of the competing crops were produced on land which had been sown the previous season, but the crops failed to germinate properly and were fed off and the land worked up again for this year's sowing. Only thirty were grown on true long fallows, the balance being stubble sown.

Good rains over most of the district late in January, 1930, gave the soils a good soaking and allowed fallows to be worked to advantage to conserve the moisture and consolidate the seed-bed. Further patchy thunderstorms during February and March were useful and created ideal sowing conditions during April and May, which proceeded without a hitch, with just sufficient rains in the interim to give excellent germination results everywhere.

Rains above the average during June, July, and August, together with an absence of frosts and abnormally mild seasonal conditions, caused rapid, rank and excessive growth in most of the crops, and feeding off was fairly general. These too mild conditions were ultimately to be the cause of many poor results, as crops were too sappy and forced in growth, and consequently were not able to stand up to a later dry spell in many instances. They also appeared more prone to attack by rust, foot rot, and to frost damage which occurred later in the season than would have been the case if they had received some hardening during a normal winter.

Where rust and frost did not cause the crop to fail altogether, much of the grain was pinched, and late rains during harvesting did not improve the position, as the grain was bleached.

However, many high yielding crops of good quality grain were harvested everywhere, and the average yield should be a good one.

The rainfall for the fallow and growing periods at various centres was as follows:—

RAINFALL Table.

—	Dubbo average	Dubbo	Cumnock	Gilgandra	Narromine	Wellington
	points	points	points.	points.	points.	points.
Fallowing Period (July, 1929, to March, 1930)	1,647	1,331	1,107	1,067	1,148	1,384
Growing Period—						
April	175	80	105	82	45	107
May	183	135	135	136	86	129
June	209	466	225	357	661	390
July	166	292	286	335	252	359
August	174	212	293	135	207	223
September	175	37	23	47	39	58
October	155	435	368	359	296	398
Total	1,238	1,457	1,435	1,451	1,586	1,664
Grand Total	2,885	2,791	2,542	2,518	2,734	3,048

Cultural Details.

The time of commencement of fallowing ranged from May to October, 1929, with an even distribution during June, July, August, and September. Disc ploughs and disc cultivators were preferred to mouldboard ploughs, the proportion being sixteen to twelve, while two competitors used rigid-tined scarifiers for the initial working. The failed areas were mostly worked up with springtooth combines and scarifiers, as weed growth was negligible.

The average number of times the fallows were worked was slightly greater than in 1929, and was as follows:—Cumnock 3.1, Dubbo 5, Gilgandra 3.6, Narromine 3, and Wellington 4.3. Fifty-three of the crops were sown with combines and only four with seed drills, showing that the former has almost completely replaced the drill as a means of sowing.

Time and Rate of Seeding.

The sowing of all competition crops was completed early, thus again strongly demonstrating that early seeding pays best. Conditions were ideal for good germination results, and crops came through quickly, which was a decided contrast to last year. The quantity of seed used has remained much about the same as last year, with the more western districts of Gilgandra and Narromine sowing from 7 to 10 lb. less than the eastern centres of Wellington and Cumnock.

The almost universal adoption of grading and the use of copper carbonate dusting of seed wheat both tend to give better germination results, consequently greatly increased quantities of seed are not warranted, though the tendency is to increase the amount of seed used.

The following table shows the time of sowing and the average amounts of seed sown.—

AVERAGE Amount of Seed Sown.

District	Month Crop Sown.			Amount of Seed per acre
	March	April	May	
				lb.
Cumnock	1	4	5	60
Dubbo	...	3	2	57
Gilgandra	...	7	5	53·3
Narromine	...	6	6	50·6
Wellington	..	7	11	61

The seed of all crops except five, *i.e.*, 93 per cent., was treated with copper carbonate, which again effectively controlled bunt. Two competitors used formalin and three no treatment at all, and in these latter crops were found the only signs of stinking smut seen.

Varieties of Wheat Used.

The numbers of crops of each variety exhibited were as follows:—

Nabawa, 26; Waratah, 16; Turvey, 3; Penny, 3; Marshall's No. 3, 2; Bobin, 1; Cleveland, 1; Federation, 1; Yandilla King, 1; Gresley, 1; Purple Straw, 1; Canberra, ½; and Bredbo, ½; making a total of thirteen varieties in the fifty-seven entries.

PLACED Varieties in the Competitions.

District.	First place	Second place.	Third place.
Cumnock	Marshall's No. 3.	Turvey	Nabawa
Dubbo	Nabawa	Penny	Waratah.
Gilgandra	Waratah Canberra	Nabawa	Nabawa.
Narromine	Nabawa	Waratah	Nabawa.
Wellington . ..	Nabawa	Nabawa	Nabawa.

Nabawa was easily the most outstanding variety, with three firsts, two seconds, and four thirds, a total of nine placings out of a possible fifteen from twenty-six entries. Waratah was the only other variety in the running, with a divided first, one second, and one third. These two varieties showed the greatest resistance to stem rust, which was present in all crops, and affected the late-maturing varieties most. The variety Bobin would have been well to the fore in the production of heavy-yielding crops except for its high susceptibility to rust, as several entries of this variety were withdrawn on this account. Of the thirteen varieties exhibited, six were slow maturers, three mid-season, and four fast growers.

Fertilisers.

Of the fifty-seven crops judged, only thirty-three were assisted by the application of varying amounts of superphosphate. This was mainly accounted for by the economic situation, the lack of ready cash to purchase fertilisers and the withholding of credit to farmers in this direction, and also by the largely increased area sown.

The average amounts applied at the various centres were:—

FERTILISER Applied.

District	Number of Entries	Number of Crops Manured	Amount applied per acre.
			lb.
Cumnock .. .	10	10	60
Dubbo	5	1	65
Gilgandra	12	10	45·5
Narromine	12	5	43
Wellington .	18	7	55
	57	33	...

The quantities used by competitors were much about the same as last year, but a decrease compared with the two previous years, when wheat values permitted a greater expenditure in this direction.

Diseases.

Stem rust appeared among all crops in this district—a period of fourteen years having elapsed since it last did any material damage. It occurred extensively on practically all farms around Dubbo and northward through

Eumungerie to Gilgandra. Narromine and the more easterly districts of Wellington and Cumnock were not so seriously affected. Late-maturing varieties, such as Penny, Yandilla King, Turvey, and Federation types, suffered most, though Gresley, Bobin, Hard Federation, and Riverina also suffered severely in most instances. Certain varieties, namely, Nabawa, Waratah, Aussie, Currawa, Wandilla, Florence, Clarendon, and Pusa showed a considerable amount of resistance to the disease, though even these varieties were more or less affected in some localities. Crops on heavy soils seem to have been affected the most.

Flag smut was again fairly prevalent in all susceptible varieties, though the economic loss occasioned by this disease was overshadowed by the rust this year.

Take-all and foot-rot were particularly prominent in the Cumnock and Wellington districts this year, and considerably lessened the yields of many crops in those centres. It is also considered that the late appearance of foot-rot in many rust-attacked crops hastened the dying off instead of allowing them to ripen normally, thus causing many total failures.

Septoria leaf blight was fairly general in crops, and assisted the rust in the destruction of flag tissue, as also did powdery mildew during the early stages of crop growth.

Frosts.

After a mild winter most crops were not hardy enough to stand up to a few severe frosts late in August and again towards the end of September, and consequently much damage was occasioned by these frosts. Some crops were caught before coming into ear in the lower stem and nodes; others when the ear was emerging from the flag or shot blade, most at the flowering stages, and a few even after the grain had formed. A few crops, after severe frost attack, had no grain in the ears at all.

The Northern District.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

THIS report concerns the competitions conducted by the Tamworth P. and A. Association (twenty-five entries), Manilla Farmers and Settlers' Association (twenty-one entries), and the Quirindi P.A. and H. Association (six entries each in the 50-acre and the 20-acre competition).

The Seasonal Conditions.

Two competitors commenced fallowing in August and 250 points of rain fell in that month, 175 points in September and 250 points in November. December was a very dry month.

Almost all competitors burnt the stubble and commenced fallowing shortly after—between January and March. The 250 points of rain in January (February was dry) and 200 points in March were opportune for

In general, the depths most favoured for cultivations ranged from 2 inches on the self-mulching soils to 4 inches on other classes of soils. The implements used varied with the different soils.

Type and Purity.

The purity of some of the entries and the rareness of admixture were evidence that growers realise that pure seed is essential to the winning of these competitions. The worst feature of a mixed crop is the difference in time of maturity; the earlier maturer carrying disease for the later maturer and the later-maturing variety delaying the harvesting of the earlier variety. Sometimes this delay results in rainstorms and heavy dews bleaching the first-matured varieties before the balance is fit to harvest.

Diseases.

Copper carbonate was used for bunt prevention in all but two cases, and portion of one crop was formalin-treated The untreated crops were bunt infected, but portions of the same crops which had been treated with copper carbonate were free from the disease. In three instances, crops produced from treated seed were also found to be infected, evidently as the result of the unsatisfactory application of the treatment or an excessive infection of the seed. Grain that is badly "bunted" should on no account be used for seed.

Flag and stem rust were severe in most crops, those least affected (some not at all) being Nabawa, Aussie, Clarendon, Florence, Cleveland and Currawa. Early-sown and early-maturing crops of Waratah, Canberra and Pusa 4 were sometimes only slightly damaged. Wandilla, though heavily rusted, yielded satisfactorily where it matured early.

The prevalence of loose smut affected the yield in one or two crops, and though take-all was not severe, it was more in evidence than last year.

Other Comment.

Superphosphate.—Having obtained payable increases in past years, two growers again used superphosphate—one at the rate of 60 lb. per acre on granite gray to red loam, and the other 56 lb. per acre on a red loam of shale origin.

Evenness.—In many crops a faulty strike, due either to a deficiency of moisture or to waterlogging of the soil or to lack of compaction caused unevenness in the stand and in date of maturity. The pulling up of plants by grazing stock also resulted in an uneven stand in some instances.

Weeds.—Although the season was favourable to the growth of thistles and wild oats, some crops were quite free, and in only a few cases were weeds at all bad.

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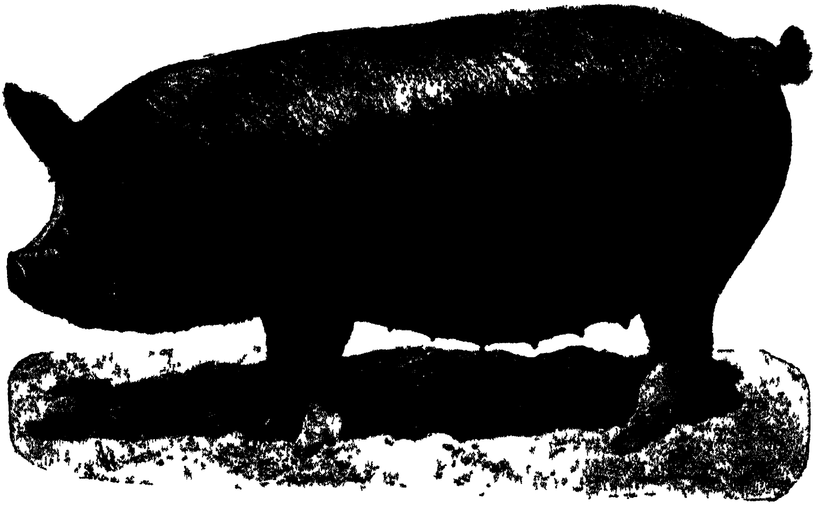

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G. D. ROSS, Under Secretary, Box 36A, G.P.O., SYDNEY.

Varieties of Wheat in New South Wales.

[Continued from Vol. 41, page 882.]

J. T. PRIDHAM, H.D.A., Plant Breeder, and A. R. CALLAGHAN, D.Phil., B.Sc., B.Sc.Agr., Assistant Plant Breeder.

THIS article commenced in last month's issue, wherein was described and illustrated Waratah, Federation, Yandilla King and Turvey. In all these instalments the varieties are given in the order of their present relative importance in New South Wales.

Canberra.

Canberra is generally supposed to have originated from a cross made at Wagga Experiment Farm between Federation (the mother) and Volga Barley, a two-row, naked sort received from Russia. The validity of the cross is now regarded as extremely doubtful; its early history is somewhat obscure, but records indicate that the progeny was such as would be expected from a violent union (as between different races of wheat); very uncommon types are usual in such cases, and it is possible that some of these segregates were mistaken for barley-types by unskilled observers. The variety Canberra received its name in 1914 and was soon widely grown in a large portion of the wheat belt, displacing Bunyip, which was then popular as a very early wheat in dry districts.

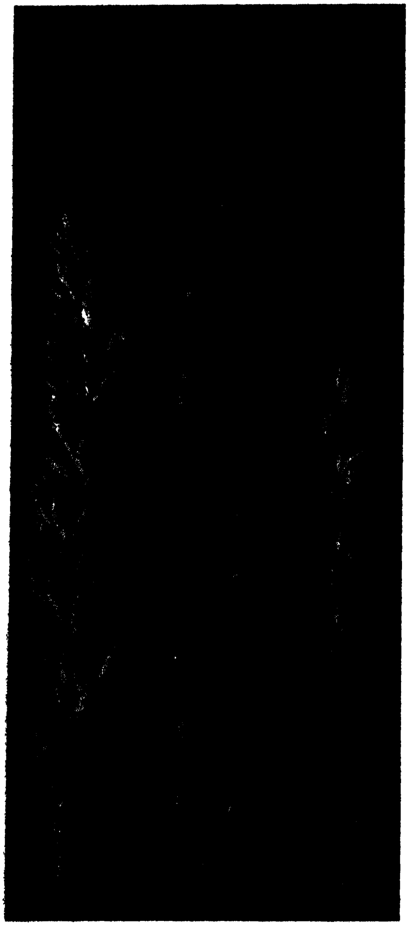
The early growth of Canberra is semi-erect to erect, with considerable tillering ability for such an early variety. The habit of growth is very compact, and the foliage throughout life is stiff and erect, with short leaf-blades. The variety grows to a moderate height and has somewhat slender straw, which is never purple. The crop is somewhat liable to lodge on account of slight weakness of the straw. Erectness of growth is a noticeable feature of the variety.

The ears of Canberra are short, light-brown when ripe, slightly tapering and bear short, minor tip-awns; the spikelets are slightly spreading and are directed very irregularly. The glumes are glabrous but lightly glaucous. The outer glumes are medium-long and of medium width with elevated shoulders. This latter character, together with the very short tip-awns, distinguish Canberra from similar types of wheat, such as Duri or Gluyas Early. The grain of Canberra has a bright yellow to golden tinge; it is elliptical with rounded cheeks, and a medium-shallow crease with no pittings; it is included in the medium-strong flour class.

Though susceptible to loose smut, and particularly so to flag smut, it usually escapes much damage from stem rust by reason of its earliness, although it is also susceptible to this disease.

Canberra was the second leading wheat in New South Wales in 1925, but in 1929 occupied only the fifth position, the area having receded from 474,797 acres to 236,399 acres during this period. The popularity of the variety is rapidly waning on account of its susceptibility to disease, particularly flag smut and loose smut, its place being largely taken by Waratah.

It is recommended by the Department for mid-season and late sowing for grain on the Central Tableland, South-western Plains, Western Riverina, and Central-western Slopes; for late sowing for grain on the South-western Slopes, Eastern Riverina and North-western Slopes; for mid-season sowing for grain or hay on the North-western Plains and the Western Plains.


Canberra.

Nabawa.

Nabawa.

Nabawa was selected from a cross between Gluyas Early and Bunyip, which was made in 1908 at Wagga Experiment Farm. Because of its susceptibility to bunt and unproductive appearance it was discarded. In the interim, however, it was introduced into Western Australia, where it was found to possess high resistance to flag smut, when this disease became troublesome in later years. It was then re-introduced into New South Wales.

Nabawa has only very moderate stooling powers, and although its early habit is semi-erect, its foliage droops over limply; the leaf-blades are long and seldom curled or folded, more often they lie quite flat. The straw is medium-tall to tall, only medium-fine and when growth has been vigorous is often weak and liable to lodge.

The white, glabrous, almost bald ears are large, oblong, and medium dense with a compact appearance due to the uniform spikelets being directed evenly on the rachis. The outer glumes are rather long and medium narrow with distinctly oblique shoulders. In Riverina, a variety somewhat similar to Nabawa, the shoulders to the outer glumes are rounded, and the spikelets are spreading and usually irregularly directed. Nabawa has a tendency to fill only two grains per spikelet instead of three or four as in other varieties, but is nevertheless productive, making up for this deficiency in length and density of head. The grain of Nabawa is distinctly yellow, never hard to thresh, but retained well, and is classed in the medium-strong flour class.

Nabawa is practically immune to flag smut under field conditions, and because of the general distribution of this disease indications point to this variety becoming the standard mid-season wheat of the State. It has also a large measure of field resistance to stem rust, but is particularly liable to leaf blight (*Septoria*).

The rise in popularity of Nabawa in New South Wales has been very rapid; in 1925 it was grown only on 155 acres, but in 1929 no less than 203,217 acres were sown to Nabawa. It is now the sixth leading variety in the State. In Western Australia it is the leading variety by a large margin, occupying over 50 per cent. of the total area under wheat. It has attained this position because it combines high resistance to flag smut with productiveness, and is able to adapt itself to widely different conditions.

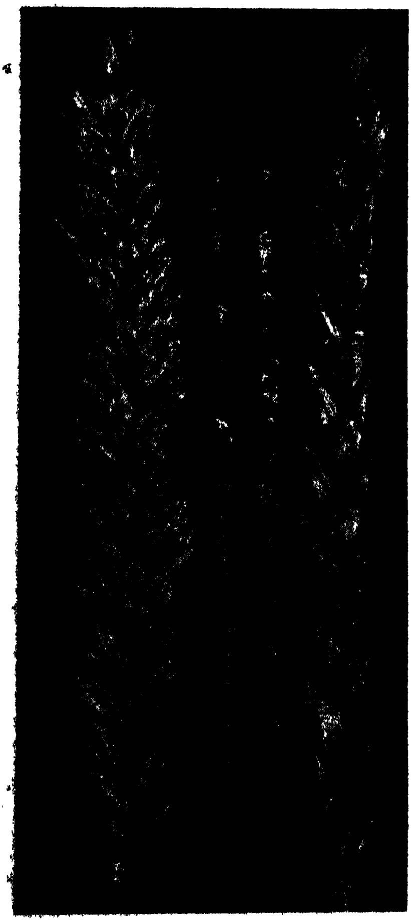
The Department recommends Nabawa for mid-season sowing for grain or hay on the South-western Slopes, Western Riverina, Central-western Slopes, and the North-western Slopes, and for grain on mallee soils in the south-west.

Bena.

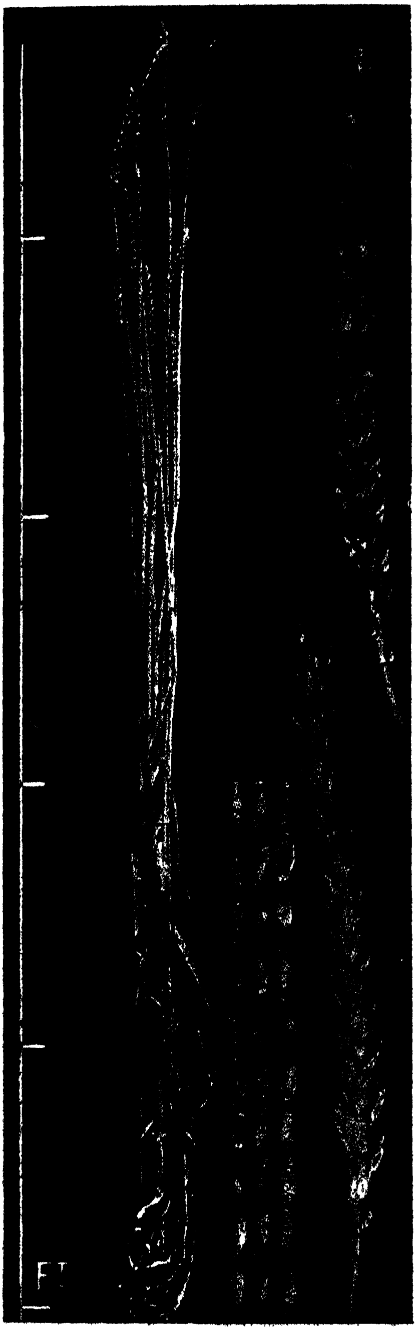
Bena was selected from Hard Federation at Cowra in 1917, and it is thought to have originated from a natural cross between Hard Federation and Marshall's No. 3; intermediate forms between these two wheats freely appeared during the time Bena was being fixed. After distribution, similar variations were frequently found in crops of the variety, indicating that further selection to the original type was necessary. This selection has since been made and the variety is now breeding true.

Bena has lax, drooping, dark-green foliage with long leaf-blades. It has a vigorous constitution with an erect early habit and good stooling ability. The straw is stout, strong, of medium height and not purple.

The brown tip-awned ear is large and bold; besides being long it is medium-dense; the density increases towards the tip and gives the ear a distinctly blunted or oblong appearance. The glumes are glabrous and the spikelets spreading. The outer glumes of Bena are large, being long and medium-wide, with rounded shoulders. Bobin resembles Bena, but has elevated shoulders to the outer glumes; besides this the head is less dense at the tip, and has not the same bold or striking appearance. The grain is



Bena.



Marshall's No. 3.

yellowish-white, plump and included in the medium-strong flour class. It is rather oval in shape with a large embryo; the crease is medium-wide and medium-deep with a very slight indication of pitting.

Although hardier than the purple straw group of wheats, Bena suffers under harsh conditions, and the grain, like Waratah, has a tendency to shatter in some seasons. It responds to good conditions and thrives on heavy soils. It is superior to Federation in the more favoured wheat districts, but on account of its rust liability it is not so suitable for the tablelands. It is also susceptible to flag smut.

In 1925 only 458 acres of Bena were grown, by 1929 this had extended to 195,126 acres; these figures testify to the rapidly-growing popularity of the variety and indicate that it is largely replacing Federation. Bena is now the seventh leading wheat grown in New South Wales.

Because of the variation referred to in the opening paragraph of this description the Department has temporarily withdrawn Bena from the recommendations, but seed sufficiently true to type should be available for distribution next year; meanwhile the districts and times of sowing recommended for Federation may apply equally to this variety.

Marshall's No. 3.

Marshall's No. 3 is a late-maturing variety, the result of a cross between Purple Straw and Ward's Prolific, made by Mr. R. Marshall, of South Australia.

In early growth Marshall's No. 3 is prostrate and has very good stooling qualities. The foliage though lax is not so drooping as Yandilla King, the leaf-blades being medium-long to short; it has a further distinction of purple colouration on the auricles and round the junction of leaf-blade with the leaf-sheath. The straw is tall, purple coloured, and although fairly strong lacks the finer qualities possessed by Yandilla King. It is, however, an excellent dual purpose variety.

The ear of Marshall's No. 3 is remarkably like that of Yandilla King; white, long, tapering, glabrous and lightly tip-awned, carried erectly on the straw. The outer glumes are medium-long and medium-wide, with narrow, rounded to slightly oblique shoulders. The grain characters of Marshall's No. 3 are distinct from Yandilla King; the grain is less plump and has angular checks accompanied by a deep, wide crease, distinctly pitted.

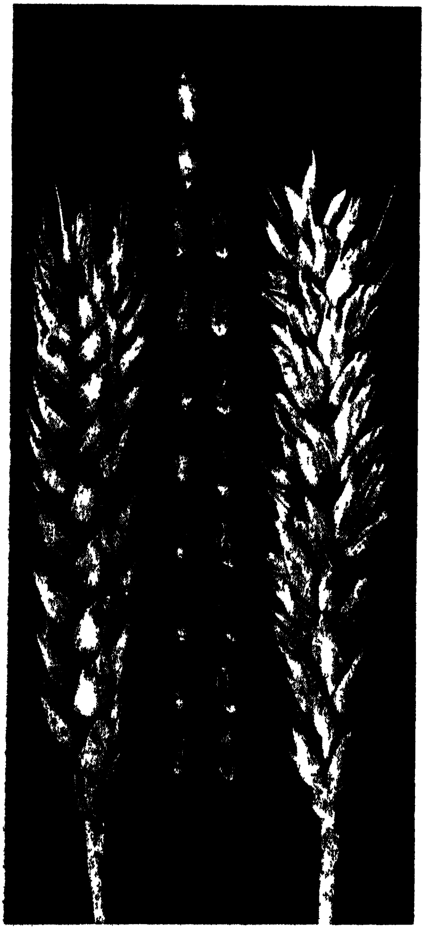
Marshall's No. 3 is better suited to lighter soils than Yandilla King. It is susceptible to both loose smut and flag smut. Although it has some reputation for rust resistance it suffers as badly as other susceptible varieties in wet seasons. However, it is slightly more rust-resistant than Yandilla King, and for this reason is better suited to the cooler districts on the Central-western Slopes, though not so suitable as Cleveland on the tablelands.

Marshall's No. 3 is the eighth leading variety of wheat in New South Wales, with an area of 141,123 acres sown in 1929. It has maintained this position, with minor fluctuations, for the past five years.

The Department recommends the variety as grain or hay for early sowing in the more favoured districts of the South-western Slopes and Eastern Riverina, and as hay for irrigation farms of the Murrumbidgee Irrigation Area when sown early.

Penny.

Penny was originally selected from a crop of Purple Straw by a farmer in South Australia.



Penny.

The variety is a moderate stooler, with long leaf-blades and drooping foliage, though the head is carried very erect. The straw, which is tall and stout, possesses qualities which make the variety suitable for both hay and grain. The crop when well grown shows a light purple tint in the straw; this character, however, is not expressed in all seasons and under all conditions.

The bold, white, club-shaped ears are distinctly tip-awned, and dense. The outer glumes of the lower spikelets have narrow, oblique shoulders with some tendency to squareness towards the top of the ear. This character differs from the distinctly elevated glume-shoulders of College Purple and Minister, or the broad round shoulders of Currawa. Major, another club-headed, white-chaffed variety, is almost bald. Penny has rather large, dark yellow grain, which is grouped in the weak flour class; it has rounded cheeks, and in spite of a somewhat shallow crease often displays a distinct pit. The varieties Lotz and World's Wonder are practically identical with Penny.

This variety is susceptible to rust, and though it has been found to be moderately free of flag smut under field conditions it is inherently susceptible to this disease.

A late-maturing variety, Penny does well in the Barellan, Grenfell, Wyalong and Temora districts, thriving better than Yandilla King on light soils and under dry conditions. The area grown in New South Wales has increased to some extent in the south since 1925; Penny is the ninth variety in order of preference, and was grown on 126,029 acres in 1929.

The Department recommends the variety for early sowing for grain on mallee soils in the South-western Plains and the Western Riverina.

(*To be continued.*)

Does Your Local Paper Cater for the Farmer?

The Department of Agriculture goes to some considerable trouble and expense to keep the press, particularly the country press, supplied with "copy" of special value to the farming community. This service is rendered per medium of the *Agricultural and Pastoral Notes*, a weekly news sheet that is mailed free of charge to every newspaper in the State. A sure indication as to whether your local paper has the interests of the farmer at heart is given by the regularity with which it reprints these *Notes*. Make a point of looking for them every week, as the information is both topical and authoritative, being supplied by practical experts in different lines of farming.

New Tomato Grading Regulations.

In the following recently gazetted regulations the "diameter of a tomato" means the greatest diameter at right angles to the line joining the stem and calyx, and "mature" is defined as that stage of growth at which the pulp immediately surrounding the seeds has changed from its original green to a dark amber colour.

The regulations require that no person shall pack for sale or sell in any package containing one half bushel or over any tomatoes other than tomatoes intended for manufacturing purposes unless (*i*) the tomatoes are mature but not soft or overripe, and are sound and free from disease, pest, serious damage, decay, and sunburn; (*ii*) the maximum variation in the diameter of the tomatoes does not exceed one inch; (*iii*) the package is legibly and indelibly marked on the exterior thereof in letters not less than three-quarters of an inch in height with the following particulars:—(*a*) the name and address or registered brand of the person, firm, or corporation by whom or by which the tomatoes were packed, and (*b*) if the tomatoes have been repacked, the words "repacked by" and the name and address or registered brand of the person, firm, or corporation by whom or by which the tomatoes were repacked.

No person shall pack for sale or sell in any package containing one half bushel or over any tomatoes intended for manufacturing purposes unless (*i*) the tomatoes are sound and free from disease and pest, and (*ii*) the package is, except when the tomatoes are supplied direct from a garden to a factory, legibly and indelibly marked in letters not less than three-quarters of an inch in height with the following particulars:—(*a*) the name and address or registered brand of the person, firm, or corporation by whom or by which the tomatoes were packed, and (*b*) the word "Factory."

Provided always that if the lettering required to be shown on the package is printed on a label pasted on the exterior of the package, they may be in letters not less than one-quarter of an inch in height.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36A, G.P.O., Sydney not later than the 12th of the month.

Wheat—	
Aussie	Manager, Experiment Farm, Trangie.
Bobin	Manager, Experiment Farm, Trangie.
Canberra	Manager, Experiment Farm, Trangie.
Exquisite	P. Corcoran, "Weeroona," Moombooldool.
Firbank	Manager, Experiment Farm, Trangie.
Florence	Manager, Experiment Farm, Trangie.
Gullen	P. Corcoran, "Weeroona," Moombooldool.
Hard Federation	Manager, Experiment Farm, Trangie.
Improved Steinwedel	Manager, Experiment Farm, Trangie.
Nabawa	Manager, Experiment Farm, Trangie.
	J. Ralston, "Strathmore Farm" Rand, via Albury.
	G. Hand, "Hill View" Narromine.
	A. McLeod Wilson, "Karrawingi," Gulargambone.
	P. Corcoran, "Weeroona," Moombooldool.
	Whitfield Bros., "Gamble," Binnaway.
	R. B. B. Gibbes, "Glenmore," old Grenfell Rd., Forbes.
Ranee	A. G. Manning, "Irriga," Ungarie.
Thew	L. G. Pryor, "Ernston" Gunnedah.
Waratah	Manager, Experiment Farm, Trangie.
	T. W. Abberfield, "Wongo Creek," Alexander Park.
	G. Hand, "Hill View," Narromine.
Yandilla King	Whitfield Bros., "Gamble," Binnaway.
Oats—	
Algerian	Manager, Experiment Farm, Temora.
Belar...	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
Buddah	Manager, Experiment Farm, Trangie.
Gidgee	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
Lachlan	Manager, Experiment Farm, Temora.
Mulga	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Temora.
Sunrise	Manager, Experiment Farm, Trangie.
Sorghum—	
Sumac ...	Manager, Experiment Farm, Bathurst.
Saccaline	Manager, Experiment Farm, Grafton.
	A. S. Pankhurst, 36 William-street, Singleton.
Collier	Manager Experiment Farm, Grafton.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

PRIVATE owners of Morris Minors, in their desire to exploit new country, have definitely established the fact that no road, or semblance of a road, provides any trouble to this wonder car.

Tracks that were looked upon as impassable have been easily negotiated, proving that the Minor could not only be described as the "World's Economy Car," but as a car that "can go anywhere."

1930 Models include Chromium-Plating, Hydraulic Shock Absorbers, Bumper Bars and Bumperettes.

Price £208

Distributors for New South Wales:

MORRIS (NEW SOUTH WALES) LTD.

WILLIAM HOUSE, 101-111 WILLIAM STREET, SYDNEY

GOVERNMENT GRAIN ELEVATORS.

(Operating under the "Wheat Act, 1927.")

Season 1930-31.

To

Wheat Growers!

WHEAT will be received on account of growers, millers, shippers, and others, at the following stations:—

- Alectown West
- Alleena
- Arthurville
- Ardlethan
- Ariah Park
- Balldale
- Barellan
- Barmedman
- Beckom
- Berrigan
- Billimari
- Binya
- Bogan Gate
- Boorowa
- Boree Creek
- Bribbaree
- Brocklesby
- Brushwood
- Buddigower
- Burrumbuttock
- Calleen
- Canowindra
- Caragabal
- Combaning
- Coolamon
- Culcairn
- Cumnock
- Cullivel
- Curban
- Dubbo
- Erigolia
- Eugowra
- Eumungerie
- Finley
- Forbes
- Ganmain
- Garema
- Geurie
- Gidginbung
- Gilgandra
- Girral
- Goonumbla
- Greenethorpe
- Grenfell
- Grong Grong
- Gunningbland
- Harefield
- Henty
- Holbrook
- Hopefield
- Illabo
- Kamarah
- Lockhart
- Maimuru
- Mangoplah
- Manildra
- Marinna
- Marrar
- Matong
- Milbrulong
- Milvale
- Mirrool
- Molong
- Moombooldool
- Munyabla
- Narromine
- Nelungaloo
- Oaklands
- Old Junee
- Parkes
- Peak Hill
- Pucawan
- Quandialla
- Rand
- Reefton
- Stockinbingal
- Tallimba
- Temora
- The Rock
- Tichborne
- Tomingley West
- Tootool
- Trundle
- Tullibigeal
- Urana
- Urangeline
- Uranquinty
- Ungarie
- Walla Walla
- Wallendbeen
- Wattamondara
- Weethalle
- Wellington
- Wirrinya
- Wyalong
- Wyanga
- Yeoval
- Yerong Creek
- Yiddah

NEW plants will be in operation at Alectown West, Curban, Erigolia, Gidginbung, Goonumbla, Nelungaloo, Tichborne, Weethalle, and Wyanga.

GROWERS should patronise the system which has been provided in their interests to enable them to effect considerable savings in the cost of handling their wheat, to ensure safe storage, and to eliminate the necessity for purchasing cornsacks.

WHEAT may be delivered from clean second-hand cornsacks.

GROWERS at non-silo stations should consign their wheat in bulk trucks to the Terminal Elevator, Rozelle, at a reduced fee.

Inquiries are Invited.

2nd Floor, Department of Agriculture,
Raphael Street, Sydney.
Postal Address:
Box 36A, G.P.O., Sydney.

E. HARRIS,
Wheat Commissioner and
Manager, Govt. Grain Elevators.

Varieties of Wheat, Oats, and Barley.

DEPARTMENTAL RECOMMENDATIONS FOR DIFFERENT DISTRICTS.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

THE following are the latest departmental recommendations as to the varieties of wheat, oats, and barley best suited to various portions of the State. Growers are reminded to make early arrangements for supply of seed, and if in doubt as to which variety to sow they should communicate with the Department of Agriculture.

WHEAT.

Coastal Districts.

[Embracing districts which are specially subject to rust.]

For Hay—

Clarendon, Florence, Firbank, Gresley (early maturing varieties).

For Green Fodder—

Gresley, Florence, Firbank, Clarendon (early maturing varieties). Sowing for hay should be made later than for green fodder.

Northern Tableland.

[Of which Glen Innes is representative.]

For Grain or Hay—

Cleveland (early sowing);
Florence (mid-season and late sowing);
Clarendon (mid-season and late sowing).

For Green Fodder—

Cleveland (early sowing);
Florence (early, mid-season, and late sowing);
Clarendon (early, mid-season, and late sowing).

Central Tableland.

[Of which Bathurst is representative.]

For Grain or Hay—

Cleveland (early and mid-season sowing);
Cadia (early and mid-season sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing).

Southern Tableland.

[Of which the Monaro, Crookwell, and Batlow districts are representative.]

For Grain or Hay—

Cleveland (early sowing);
Yandilla King (early sowing);
Waratah (mid-season and late sowing).

South-western Slopes and Eastern Riverina.

[Of which Wagga, Temora, Wyalong, and Barellan are representative.]

For Grain or Hay—

Yandilla King (early sowing);
Turvey (early sowing);
Marshall's No. 3 (early sowing, for more favoured districts);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing).
Baroota Wonder (mid-season and late sowing).

For Grain only—

Union (early and mid-season sowing);
Federation (early and mid-season sowing).

For Grain on Mallee Soils—

Currawa (early sowing);
Penny (early sowing);
Nabawa (mid-season sowing).

For Hay only—

Zealand (early sowing);
Gresley (mid-season sowing).

South-western Plains and Western Riverina.

[Of which Deniliquin, Cargelligo, and Hillston are representative.]

For Grain or Hay—

Waratah (mid-season sowing);
Gresley (mid-season sowing).

For Grain only—

Federation (early and mid-season sowing);
Union (early and mid-season sowing);
Canberra (mid-season and late sowing).

For Grain on Mallee Soils—

Currawa (early sowing);
Penny (early sowing);
Nabawa (mid-season sowing).

Central-western Slopes.

[Of which Dubbo, Gilgandra, Wellington, Cowra, Grenfell, Forbes, and Parkes are representative.]

For Grain or Hay—

Cleveland (early sowing, especially suitable for the cooler portions of this district, such as Coonabarabran);
Cadia (early sowing, especially suitable for the cooler portions of this district, such as Coonabarabran);
Yandilla King (early and mid-season sowing);
Turvey (early and mid-season sowing);
Penny (early and mid-season sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing).

For Grain only—

Wandilla (early and mid-season sowing);
Federation (early and mid-season sowing);
Union (early and mid-season sowing);
Duri (mid-season and late sowing).

North-western Slopes.

[Of which Tamworth and Gunnedah are representative.]

For Grain or Hay—

Cleveland (early sowing, especially suitable for the cooler portions of this district, such as Inverell and Delungra);
Currawa (early sowing);
Yandilla King (early sowing);
Wandilla (early sowing);
Nabawa (mid-season sowing):
Waratah (mid-season and late sowing);
Clarendon (late sowing).

For Grain only—

Canberra (mid-season and late sowing);
Aussie (mid-season and late sowing);
Duri (mid-season and late sowing).

North-west Plains.

[Of which Coonamble is representative.]

For Grain or Hay—

Canberra (mid-season and late sowing);
Florence (mid-season and late sowing);
Clarendon (early, mid-season and late sowing).

Western Plains.

[Of which Nyngan, Trangie, and Condobolin are representative.]

For Grain or Hay—

Nabawa (early sowing);
Hard Federation (early sowing);
Waratah (mid-season sowing);
Riverina (mid-season and late sowing).

For Hay only—

Firbank (early and mid-season sowing).

Murrumbidgee Irrigation Areas.

For Grain or Hay on the Irrigated Areas—

Marshall's No. 3 (early sowing);
Yandilla King (early sowing);
Turvey (early sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing).

For Grain only on the Irrigated Areas—

Wandilla (early sowing);
Federation (early and mid-season sowing);
Union (early and mid-season sowing).

For Hay only on the Irrigated Areas—

Zealand (early sowing);
Gresley (mid-season and late sowing).

For Grain or Hay on Dry Areas—

Yandilla King (early sowing);
Turvey (early sowing);
Nabawa (mid-season sowing);
Waratah (mid-season and late sowing);
Baroota Wonder (mid-season and late sowing).

For Grain only on Dry Areas—

Union (early and mid-season sowing);
Federation (early and mid-season sowing).

For Hay only on Dry Areas—

Gresley (mid-season sowing).

OATS.

The varieties recommended by the Department for the various portions of the State are as follows:—

North Coast.—Algerian (for grazing), Sunrise, Mulga, Buddah.
South Coast.—Algerian, Guyra, Sunrise, Mulga, Buddah.
Central Tableland.—Algerian, Guyra, Lachlan, Mulga.
Northern Tableland.—Reid, White Tartarian, Algerian, Guyra.
Southern Tableland.—Algerian, Guyra, Sunrise, Mulga, Myall.
Monaro.—White Tartarian, Algerian, Mulga.
South-Western Slopes and Riverina.—Algerian, Guyra, Belar, Mulga.
Central-western Slopes.—Algerian, Guyra, Belar, Mulga, Buddah.
North-western Slopes.—Algerian, Guyra, Belar, Sunrise, Mulga.
Under Irrigation.—Algerian, Guyra, Sunrise, Mulga.
Western Plains.—Sunrise, Gidgee, Mulga, Buddah.

BARLEY.

The varieties recommended by the Department are:—

Two-row type (commonly called "malting barleys").—Pryor.
Six-row type (commonly called "feed barleys").—Skinless for early winter green feed. Cape and Trabut for green fodder, and grain for stock in the cooler districts.

PURE SEED SUPPLY.

In each issue of this *Gazette* is published a list showing where pure seed of the various varieties recommended to farmers may be obtained. These supplies come either from the Department's experiment farms or from reliable farmers in different districts who are concentrating on the selection and improvement of varieties, which are kept pure and maintained or improved in yielding capacity.

TRAP AND POISON THE BLOWFLY.

COMMENTING recently on the prevalence of the blowfly this season, Mr. Max Henry, Chief Veterinary Surgeon of the Department of Agriculture, said that it was to be regretted that trapping and poisoning of the flies were not more generally carried out. One reason often given for such neglect was that it was thought to be of little value for one owner to trap and poison while his neighbours failed to do so. It was true, Mr. Henry remarked, that flies did travel considerable distances, but the majority remained comparatively localised, and stockowners who regularly poisoned were of the opinion that the value of such action was by no means to be disregarded even though their neighbours failed to co-operate.

Readers should not fail to write to the Department, Box 36A, G.P.O., Sydney, for a copy of the recently issued leaflet on the blowfly.

Farm Forestry.

V. THE NATIVE AND INTRODUCED TREES OF NEW SOUTH WALES.

[Continued from vol 41, page 902.]

R. H. ANDERSON, B.Sc.Agr., Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, University of Sydney.

THE COASTAL DIVISION—*continued.*

Native Trees of the Coastal Division—*continued.*

THE brush forests of the Division contain a representative flora of the family Sapindaceae, including a number of species of *Alectryon, Cupaniopsis, Arytera, Castanospora*, and *Toechima*. These are mainly small trees of no particular importance, but are occasionally cultivated as ornamental or shade trees.

Alectryon tomentosus is one of the more common of these species and occurs as a small to medium-sized tree with pinnate leaves northwards from the Clarence River. The young shoots, leaf undersurfaces, and the lobed fruit are rusty hairy. The species makes an attractive small ornamental tree.

The Foambark Tree (*Jagera pseudorhus*), a related species, occurs in the northern subdivision and also forms a very attractive ornamental tree. It is favoured by bees.

The Native Quince (*Alectryon subcinereus*) is found as a shrub or small tree throughout the Division.

RED ASH (*Alphitonia excelsa*).

A small to medium-sized tree with smooth bark found both in open forest country and in brushes from the Shoalhaven River northwards. It is more commonly found in the drier portions of brush lands and extends to the North-western Slopes, going as far west as Boggabri. (See *Agricultural Gazette*, 1928, page 921.) It is also known as "Leather Jacket," "Red Tweedie," and "Cooper's Wood," and can be recognised by the peculiar odour, resembling sarsaparilla, of the young shoots when bruised or broken.

"Leaves entire, alternate, green above, white beneath with a close tomentum. Flowers small, in dense cymes or panicles. Fruit a dull bluish black drupe about ½ inch diameter and with shiny reddish-brown seeds."

Uses.—The timber is straight-grained, easily worked and darkens on exposure, developing a striking bright red colour. It has little figure, but the attractive colour makes it suitable for ornamental panelling, &c. It is fairly tough and durable and has been used for tool handles and lining boards. The tree can be raised from seed and is a moderately useful shade and shelter tree. The bark has some tanning properties.

BONEWOOD (*Emmenospermum alphitonioides*).

A medium to large-sized tree with a grey, slightly wrinkled to fairly rough bark found in brush forests from the Illawarra district northwards. It is also sometimes known as "Soapwood."

"Leaves opposite, ovate-elliptical, paler beneath, 2 to 3 inches long. Flowers small, in short panicles. Fruit an orange-coloured capsule nearly globular, ¼ to ½ inch diameter, containing red or purplish seeds."

Red Ash (*Alphitonia excelsa*).

Uses.—The timber is pale yellow, straight-grained, hard, fairly heavy and rather difficult to work. It is durable and has been used for tool handles, boatbuilding, and general building purposes. It is said to be a good bending timber.

BLUEBERRY ASH (*Elaeocarpus reticulatus*).

A small tree or large shrub found fairly commonly throughout the Division on a variety of sites, including stony hillsides, along watercourses, and in open country. It also extends to the Tableland Division.

"Leaves elliptical-oblong, 3 to 5 inches long, strongly veined, shallowly toothed. Flowers white, fringed, in racemes. Fruit a blue, globular or egg-shaped drupe up to ½ inch long."

Uses.—It is a most ornamental species, both flowers and fruits being very attractive, and is well worthy of cultivation as an ornamental small tree or large shrub. It has been receiving attention lately in the Sydney newspapers under the name of the "Lily of the Valley," a name which does not appear to be so suitable as the older and more widely known one of Blueberry Ash.

A closely related species, *Elaeocarpus obovatus*, which is also known as "Blueberry Ash" is found northwards from Sydney, but chiefly in the northern subdivision, on good fairly moist soils. Although sometimes only a small tree it reaches a height of 90 to 100 feet. It resembles *Elaeocarpus reticulatus* in general botanical characters, differing chiefly in the leaves being not so finely and conspicuously veined as in that species, and in the flowers being smaller but more numerous in the racemes. It is also a very ornamental species and the pale-coloured light timber is occasionally used for indoor joinery and cabinet work.

PIGEON-BERRY ASH (*Elaeocarpus Kirtoni*).

A medium-sized tree occasionally reaching 100 feet in height, with grey, fairly smooth bark, found in scattered localities northwards to the Queensland border from the Cambewarra Ranges near Nowra. It is also sometimes known as Whitewood.

"Leaves alternate, lanceolate, margins toothed, 3 to 7 inches long, the venation conspicuous, the stalks 1 to 1½ inches long. Flowers white, fringed in slender racemes. Fruit an egg-shaped drupe about ½ inch long."

Uses.—It is an ornamental species worthy of cultivation. The timber is pale-coloured with a dark heart, close-grained, and easily worked. It should be useful for general indoor and cabinet work, and has been mentioned as suitable for oars, but, owing to its comparative scarcity, is seldom used.

A related species, *Elaeocarpus grandis*, is found in a few localities northwards from the Nambucca River. It is generally known as Blue Fig or Brush Quandong, and is a fairly large tree with grey bark and greenish-white flowers. The pale-coloured light, fairly soft timber is regarded as suitable for general indoor joinery and possibly cabinet work.

Another species, *Elaeocarpus eumundi*, occurs as a fairly large tree northwards from Mullumbimby.

MAIDEN'S BLUSH (*Sloanea australis*).

A medium to large-sized tree often of rather irregular growth habit with a brown or greyish, somewhat scaly bark, found in brush forests from Kiama northwards.

"Leaves large, alternate, obovate or elliptical, 4 to 10 inches long, the margins toothed. Flowers downy, cream-coloured, about 1 inch diameter, single or in racemes. Fruit a hard capsule densely covered with rather soft bristles. Seeds black and shiny."

Uses.—The timber is pinkish, light in weight, close-grained and easily worked, and is considered suitable for inside joinery and cabinet work.

YELLOW CARIBEEN (*Sloanea Woollsii*).

A medium to large-sized tree up to 140 feet in height, with a brown or brownish-grey bark, found in brush lands in the northern subdivision.

"Leaves alternate, elliptical, 3 to 5 inches long, the margins toothed. Flowers about ½ inch diameter, in racemes. Fruit a capsule about ¾ inch long, covered with rigid pointed bristles."

Uses.—The moderately light timber should be useful for general indoor work and some classes of cabinet making.

THE FLAME TREE (*Brachychiton acerifolius*).

A medium to large-sized deciduous tree with a fissured or wrinkled greyish-brown bark and more or less swollen stem, found in brush lands from the Illawarra district to Queensland.

"Leaves alternate, large, up to 10 inches long, and often as broad as long, variable in shape, but generally lobed. Flowers large, red, bell-shaped, in panicles. Fruit formed of three to five large boat-shaped follicles up to 5 inches long, enclosing the seeds embedded in a loose, hairy covering."

Uses.—This is a most ornamental and attractive species, the tree being a mass of brilliant scarlet flowers just before the leaves appear. It is well worthy of planting both as an ornamental and shade tree, but prefers a fairly good moist soil in sheltered areas for its best development. The timber is very soft, light and pale-coloured, and so far has little value. The bark is often 2 inches in thickness and furnishes a lace-like fibre which has been used for rope, mat, and hat making.

The closely allied species, *Brachychiton discolor*, is also sometimes known as "Flame Tree" or "Lace-bark Tree." It differs from the Flame Tree in the leaves being white or pale-coloured on the undersurface, and by the flowers being larger. The latter are up to 2 inches long, pink to red in colour, and deciduous, forming a carpet of blooms beneath the tree in season. The leaves are not so completely deciduous as in the Flame Tree, except in the cooler districts. It is found in brush land from Dungog northwards.

Another allied species, *Sterculia quadrifida*, is found in some of the brush forests of the northern subdivision. It differs from the above species in the leaves being entire.

CROWSFOOT ELM (*Tarrietia argyrodendron*).

A medium to large-sized tree with a grey or brown, somewhat roughened bark, found fairly commonly in brush lands in the northern subdivision from the Manning River to Queensland.

"Leaves compound, consisting of three leaflets which radiate from a common point at the end of the stalk, the leaflets silvery underneath with scurfy scales. Flowers small, in panicles. Fruit consisting of a nut continued into a wing about 1 inch long."

Uses.—The species makes a handsome ornamental and shelter tree, although probably rather slow growing. The timber is attractively figured, somewhat like Silky Oak, splits freely and is suggested as suitable for cabinet work, case-making and staves. It is said to be liable to borer attack.

Black Jack (*Tarrietia actinophylla*) is a similar tree, used for the same purposes, but is readily distinguished by the leaflets being usually seven to nine in number and without scurfy scales on the undersurface. It is found north of Gloucester.

Both the above species are also known as "Stavewood" and "Ironwood."

SCOLOPIA (*Scolopia Brownii*).

A small to medium-sized tree found in brushes or their outskirts northwards from the Illawarra district.

"Leaves 2 to 3 inches long, lanceolate or rhomboidal, often with several obscure teeth. Flowers small, white, with numerous stamens. Fruit a small berry about ½-inch diameter."

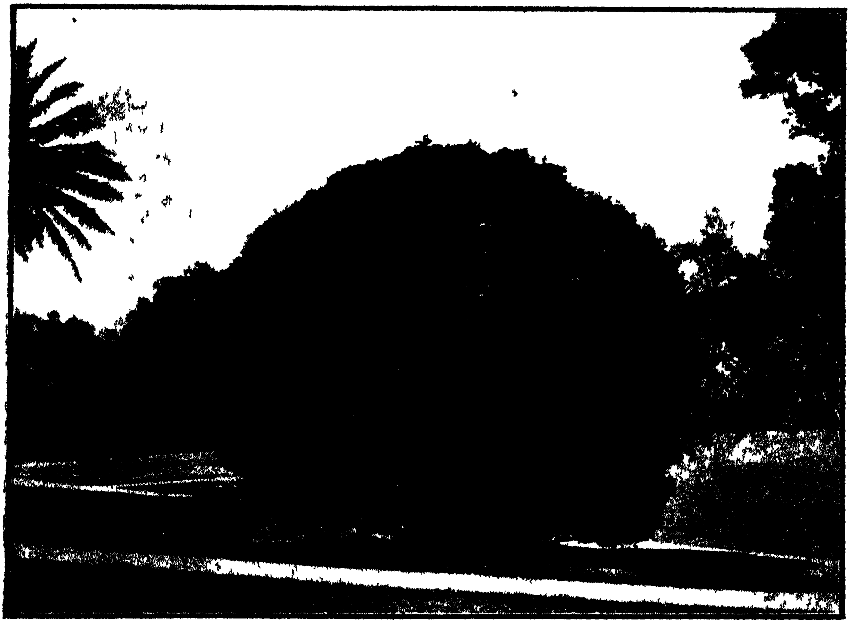
Uses.—This is a most ornamental species, forming a dense symmetrical growth, and is worthy of wider cultivation. It stands cutting back well and is readily propagated from seed.

Eugenia spp.

The various species of Eugenia constitute an interesting part of the brush forest flora of the Division, and furnish a number of attractive ornamental trees. Many of them bear a profusion of berries, and the leaves are dense, handsome, and glossy. The young growth of several is light pink in colour and very attractive, contrasting nicely with the dark green of the older leaves. Botanically, they are characterised by having opposite leaves with tapering apices, flowers with numerous stamens and four petals. Eleven species occur in this State, of which the Lilly Pilly (*Eugenia Smithii*) is the most widely distributed and best known.

The Lilly Pilly is found throughout the Coastal Division, usually in sheltered positions on moderately good deep soil, and most commonly near streams. It is a small to medium-sized tree, sometimes reaching 60 feet in height, with a brown, slightly scaly bark. The succulent fruits are produced in profusion, and are white with a purplish tint and up to 1 inch in diameter. They are edible and have an acidulous taste. The species makes a fine ornamental and shade tree, but, like other Eugenias, is subject to wax scale and sooty mould in some districts.

The Small-leaved Eugenia (*Eugenia luehmanni*) occurs as a medium-sized tree with very slender branchlets in portion of the northern subdivision from the Richmond River to Queensland. The fruit is red coloured and the species is a most ornamental one, well worthy of cultivation as a garden plant. It stands cutting back well, forming a dense, round topped growth, and the bright pink young leaves are very attractive.



Small-leaved Eugenia (*Eugenia Luehmanni*)

The Weeping Eugenia (*Eugenia ventenatii*) is a fairly common tree along streams in brush country northwards from the Hastings River. It also is an ornamental species.

Eugenia Francisii, known in Queensland as the Giant Water Gum, is found northwards from the Richmond River, generally along fresh water streams, and at times forming a very large tree. Several specimens of this tree are growing in the Sydney Botanic Gardens, forming fine, symmetrical, densely topped trees.

Brush Cherry (*Eugenia myrtifolia*) is found fairly commonly in brush lands from the Illawarra northwards. It is usually a small tree or large shrub, but occasionally reaches over 50 feet in height. It forms a very attractive garden subject, having a profusion of red oval fruits.

The Rose Apple (*Eugenia Moorei*) has large, rather thick leaves and large pink flowers borne on the old wood. It is found in the Richmond and Tweed River districts and has large fleshy fruits often over 2 inches in diameter and white in colour suffused with green.

Eugenia cyanocarpa is characterised by the fruit being purplish blue in colour. It occurs northwards from Port Hacking, being a small to medium-sized tree.

Eugenia brachyandra is known as "Red Apple" or "Cherry" and forms a very handsome tree in portions of the northern subdivision, being fairly common along the Richmond River and its branches. The bright red fruit is borne in great profusion and is up to 1 inch in diameter.

The remaining species, *Eugenia hemilampra*, *Eugenia corymantha*, and *Eugenia Hodgkinsoniana*, are found in the northern subdivision.

Closely allied to the Eugenias are the native Myrtles (*Myrtus* spp.) which occasionally form small trees, but are more commonly shrubby in growth. Some six species are found in brush lands both north and south of Sydney, but they are usually too small to be of any importance. The allied species, *Rhodomyrtus psidioides*, is found as a small to medium-sized tree northwards from the Hunter River.

Another allied genus is *Rhodamnia*, which contains two species found in the Coastal Division.

Rhodamnia trinervia is often known as Brush Turpentine, and is a fairly common tree in brush forests from the Illawarra district northwards. It occasionally reaches 70 feet in height, but is more commonly met with as a small tree or shrub. It is distinguished by the opposite downy leaves, which are strongly marked by three longitudinal veins.

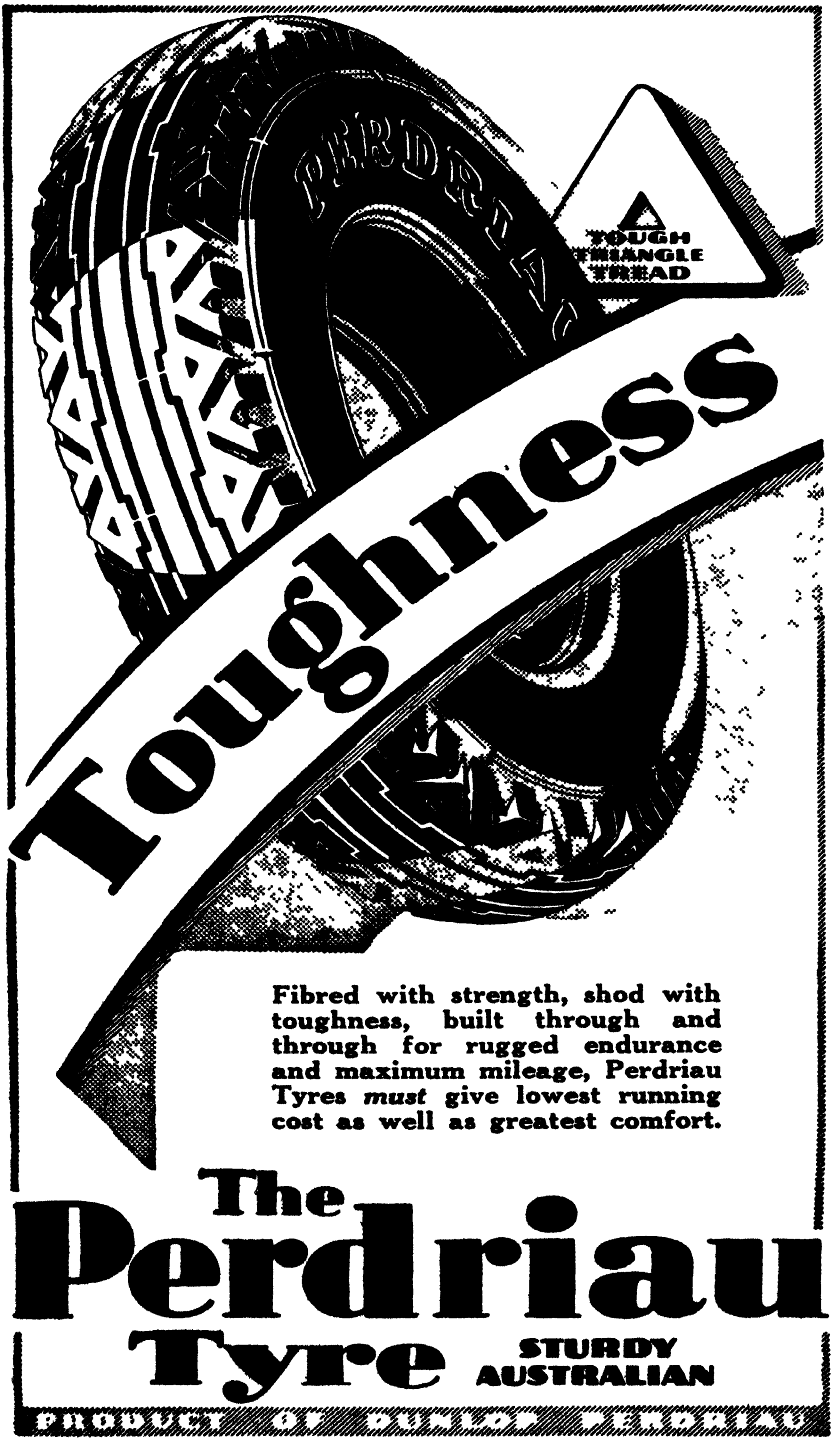
The second species, *Rhodamnia argentea*, occurs as a medium-sized tree in the brushes of the northern subdivision. The leaves are also three-nerved, but are densely silvery white on the undersurface. The timber is occasionally used for general building purposes.

Turpentine Tree (*Syncarpia laurifolia*).

A medium to large-sized tree with brown, flaky, fibrous bark found throughout the Coastal Division northwards from Ulladulla. It is found in a variety of sites and soils, including the poorer types, but is typically a tree of moderately good and moist soils, being associated with the better class of Eucalyptus forests and brush forests.

"Leaves opposite, ovate, thick, 2 to 3 inches long, dirty white on the undersurface. Flowers white, the individual flowers united by their calyces, forming dense round heads. Fruit globular, hard and woody, formed of a number of united capsules."

Uses.—This tree is most useful for general shade and shelter and for windbreak formations. It forms a dense growth, which makes an admirable break and is especially suited for orchard work, as it is very free from insect and fungal diseases. It coppices freely and stands cutting back well, and will form a trim dense hedge or small break which is very long lived.



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Turpentine Trees (*Syncarpia laurifolia*)

It is frequently left standing (during clearing operations) for shelter purposes, and is worthy of planting, being easily propagated from seed. The timber is reddish in colour and is used extensively for piles, being more or less resistant to marine borers. It is preferred to leave the bark on when using for piles. The timber is also fairly resistant to white ants and is strong and durable, but is apt to warp and crack badly when drying.

BRUSH BOX (*Tristania conferta*).

A medium to large-sized tree with a brown or grey, rather variable, bark, often scaly or box-like on the lower trunk with smooth upper trunk and branches. It is found commonly on the edge of rain forests and in the moister Eucalypt forests northwards from Port Stephens.

"Leaves alternate, elliptical, crowded towards the ends of branchlets, 3 to 6 inches long. Flowers white, in small cymes, the individual flowers about 1 inch diameter. Fruit a bell-shaped, flat-topped capsule about ½ inch long, opening in three valves."

Uses.—This is one of the most commonly used trees in the Sydney district for street planting, being especially suited for this purpose. It forms a very attractive, densely-foliaged tree, makes fairly rapid growth, and is suited for planting for shade and shelter purposes. It does well in a variety of sites, but prefers a heavy soil for its best development. The timber is close grained, hard and fairly heavy, but is rather difficult to season. It is suited for mauls, mallets, wedges for shipbuilding yards, and decking for bridges, wharves, &c. It is said to be one of the best timbers for resisting white ants.

WATER GUM (*Tristania laurina*).

A small to medium-sized tree with a scaly bark in older trees, but smooth in the younger ones. It is commonly found along fresh water streams or in damp situations throughout the Division.

"Leaves alternate, narrow elliptical, paler on the undersurface, 2 to 5 inches long. Flowers yellow, in short cymes. Capsule oval, three-valved, filling the calyx-tube and projecting considerably beyond it."

Uses.—The pinkish-grey timber requires careful seasoning to prevent it splitting, but is close-grained, tough, strong and fairly light, being particularly suited for tool handles, mallets, &c.

An allied species, *Tristania neriifolia*, also known as "Water Gum" is found in similar situations along creeks, &c., in the Port Jackson, Illawarra, and Blue Mountains districts. It can readily be distinguished from *Tristania laurina* by the leaves being opposite and the capsule not protruding from the calyx-tube.

A fourth species, *Tristania suaveolens*, sometimes known as "Swamp Turpentine" is found in the northern subdivision in rather heavy soils on flats, associated with Eucalypts.

The timber in both the above species is similar to that of *Tristania laurina*, and has similar uses.

(*To be continued.*)

Pasture Management.

WITH PARTICULAR REFERENCE TO THE CARE OF SOWN PASTURES.

A. W. S. MOODIE, H.D.A., H.D.D., Assistant Agrostologist.

MANY of the shortcomings of our pastures can be traced to mismanagement, and now that so much attention is being paid to the question of pasture improvement, some general recommendations on the care and proper treatment of sown pastures and native grass areas should prove helpful

Land-owners are embarking on a policy of increasing production by the sowing of grasses and clovers and by topdressing, but unless this work is followed up by proper management, maximum benefits are not likely to be obtained. No wide differences exist between the management of sown pastures and natural pastures, but as the treatment of natural pastures frequently leaves much to be desired, it may reasonably be assumed that some of the sown pastures are similarly handled. Failure to establish sown pastures has in many cases been found to be due entirely to bad treatment and not to the unsuitability of the pasture plants, soil, or seasonal conditions, as was supposed by the farmers concerned. It has also been noticed that where small areas of sown pastures are laid down, there is often a tendency to crowd all the stock possible on to these areas, leave them on for long periods, and if the plants fail to stand up to this abuse, to condemn them as useless and unsuitable. In some instances this is probably due to lack of knowledge of the requirements of the plants used and of the proper uses of sown pastures, but in others it is due to a desire to recoup all the expenditure incurred in laying down the pastures in the first season.

Carrying Capacity Increased.

The principal object of improving pastures is to increase the carrying capacity of the holding. This may be achieved, once the improvement work has been undertaken, by gradually increasing the number of stock carried, while on the other hand the elimination of losses due to drought and to shortage of winter feed in cold districts, and losses due to diseases caused by malnutrition will further assist in improving the carrying capacity.

Sown pastures should be managed so that succulent feed and clean paddocks will be available for lambing ewes, for "topping off" lambs, as a tonic for sick animals, and to provide grazing during periods when the natural pastures are depleted. With good management and, as the areas under improved pastures increase, a gradual increase in the number of stock that can be safely carried on the holding will be obtained without harm to the pastures.

An efficient system of pasture management should aim at maintaining a good supply of succulent pasturage to be grazed at the stage of maximum feeding value, at prolonging the life and productivity of the pastures, especially the more palatable and nutritious plant species, at providing a change of feed for stock and ensuring a supply of feed in the seasonal periods of shortage which occur in every district. Rotational grazing followed by treatments to maintain pasture fertility, such as top-dressing, harrowing, mowing if necessary and practicable, and re-seeding, may all enter into the system.

Handling Sown Pastures.

Sown pastures may be stocked as soon as the plants have made sufficient root growth to withstand grazing, and it is preferable to commence by turning in a fairly large number of stock and leaving them in the paddock for a short time only; they must be removed as soon as the growth is shortened back. Regulated grazing in the early stages encourages the plants to stool out and make stronger growth. Stock should not be turned onto young grasses and clovers if the weather is wet and the ground boggy and soft, for the tramping under these conditions will kill out many of the plants; when the land settles down and becomes firm, the liability of plant damage from this cause is reduced. As the plants develop, the stocking periods can be lengthened until eventually normal grazing can be carried out, which, however, should be rotational. During the early grazing periods it is advisable to observe closely the grazing behaviour of the stock, and in the event of their paying too much attention to comparatively slow growers such as *Phalaris bulbosa*, they should be removed for a time.

Fig. 1.– A Well-managed Pasture on the South Coast.
Before treatment, which included top-dressing, harrowing and rotational grazing, this paddock was in a similar condition to the one shown in Fig. 2.

If the pasture mixtures have been sown at the correct time (autumn) and have made normal headway, vigorous growth will be made in the spring, during which period vigilance will be required. In the event of the pasture mixture containing annuals, such as Wimmera Rye grass and Subterranean clover, it is essential to remove the stock or to stock very lightly until these plants form seed, thereby ensuring their permanency in the pasture. At the same time it is not advisable to allow the perennials to seed freely, so that grazing should be resumed as soon as the annuals have seeded, when fairly heavy stocking may be advisable. The fact that Wimmera Rye grass and Subterranean clover have failed to reappear in the second year has frequently been traced to heavy stocking in the spring of the first year preventing these plants from seeding. With perennials in the mixture, such as Perennial Rye, Cocksfoot, *Phalaris bulbosa,* Tall Oat, and Tall Fescue, and no annuals, the aim should be to prevent free seeding in the first year, as this is likely to weaken the plants and result in spindly growth. Under-stocking of perennials at this stage will result in the grasses getting ahead of the stock and becoming "stemmy" and unpalatable.

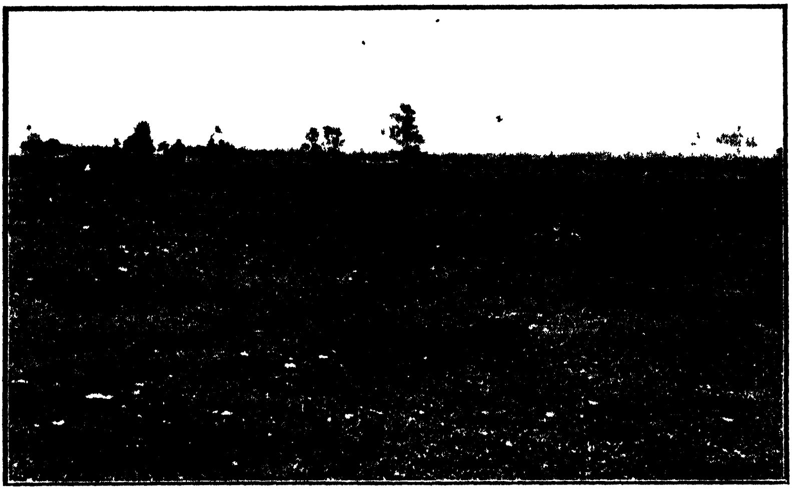


Fig. 2. Showing the Effect of Bad Management.

The soil conditions, etc , were the same as in Fig 1, only a narrow roadway separating the two paddocks.

In the second year less attention need be paid to the seeding of the annuals, except in cases where their re-appearance has been disappointing, when care to ensure seeding will again be necessary. There is no advantage in allowing the perennials to seed until they show signs of thinning out; seeding will then enable them to thicken up considerably. *Phalaris bulbosa,* the seed of which is expensive, is frequently sown very thinly and allowed to seed the first year to form a good stand; when this has been obtained, however, seeding should be controlled.

Where quick-growing annuals are sown with perennial grasses in order to provide feed while the perennials are becoming established, it may be necessary to stock heavily in the spring to prevent free-seeding of the annuals, otherwise there is a danger that they may become dominant and eventually crowd out the perennials. Annuals usually seed more freely and reproduce from seed more readily than do perennials, and for this reason they are likely to preponderate in the pasture if not properly managed, to the detriment of the year-round carrying capacity of the pasture.

When seed such as Wimmera Rye grass and Subterranean clover is broadcasted on natural grass country a large number of stock should be allowed to graze until they have trodden the seed in, and then moved until rain has germinated the seed and the plants have made sufficient growth to stand grazing. In the first year the aim should be to allow these plants to seed as freely as possible, which will ensure their permanent establishment. In the second year they will probably form seed, although the paddock may be stocked; in the event of dry spring conditions in the second year it may be necessary again to stock lightly.

Excessive grazing of young pastures must always be avoided, as the plants are denied a chance to develop and the stock display a tendency to graze the more palatable species, eventually eating them out altogether.

Preserving Native Grass Areas.

Natural pastures composed of such plants as the Wallaby (*Danthonia* spp.), Windmill (*Chloris* spp.), Blue (*Andropogon* spp.), and the Panic (*Panicum* spp.) grasses should also be carefully managed in order to preserve the most useful species and to prevent the ingress of weeds and useless grasses. It is a matter for regret that much of our grazing country has been so badly managed that these excellent grasses have disappeared from some areas.

Where useful native grasses are still in existence on a property they should be encouraged to seed and spread by properly regulated grazing and by avoiding overstocking. Paddocks of native grasses showing signs of seeding should be rested or lightly stocked until seed has ripened and fallen, after which normal stocking may be resumed. A system can easily be evolved whereby a number of paddocks can be allowed to seed each year and by adopting this practice the grasses will thicken up considerably. The majority of the useful native grasses are commonly known as "root" grasses by graziers, and their presence adds considerably to the drought-withstanding capabilities of a property.

The Subdivision of Paddocks.

No hard-and-fast rules can be laid down with regard to this matter, as the conditions vary so much in different districts and even on the same property. The aim should be provide sufficient paddocks to control the grazing completely, so that an even growth can be maintained in each. With controlled stocking the pastures can be fed off when at their maximum feeding value, *i.e.*, when they are providing short, succulent growth high in protein content, and there is no waste such as is associated with more mature but less palatable and nutritious growth.

Paddocks that are too large result in stock having to travel long distances for food and water, which is particularly undesirable for fattening stock, as much of the food consumed is then used to supply energy for unnecessary walking. This point is of importance to those contemplating fat-lamb raising or the production of early-maturing beef. Large paddocks are also responsible for a certain amount of erosion, as the animals in their search for food tend to traverse definite tracks, which become bare of grasses. In hilly country these bare tracks form channels along which water flows, finally resulting in erosion.

The expenditure entailed in laying down large areas of sown pastures on well-prepared land is considerable, and although returns amply justify the outlay, some pastoralists have not the capital available for this work on a large scale. By choosing the most suitable soils and situations, however, it is remarkable what excellent results can be obtained from small areas of sown pastures when used in conjunction with larger areas of natural pastures, and graziers with limited capital should proceed on these lines. Creek-frontage country properly subdivided, with the land well prepared and sown down to mixtures of grasses and clovers or lucerne, is particularly suitable for this purpose. These areas should be subdivided and fenced so that stocking can be regulated and the stock given access both to the sown and natural pastures; it should always be possible to close up the sown pasture when necessary. It may be thought that where stock have ready access to sown pastures they will concentrate on these and neglect the natural pastures. In practice, however, this is seldom the case, as a certain amount of rough feed is essential and the stock will obtain this from the natural grasses. By adopting this system stock can be left

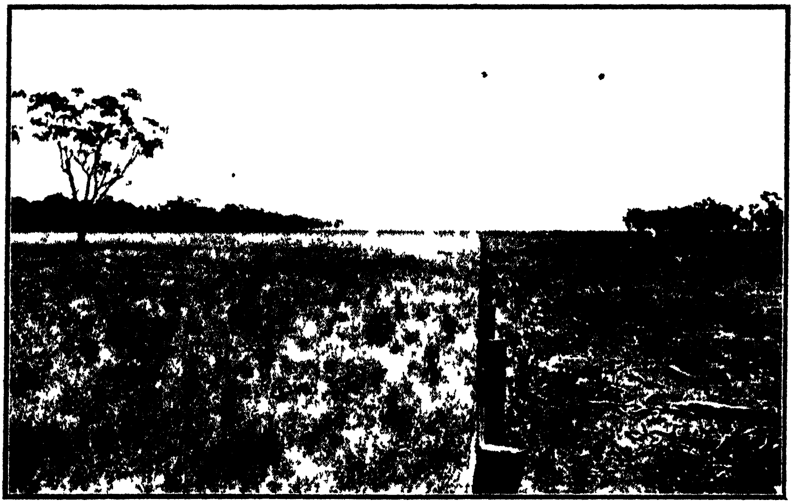


Fig. 3.—A Comparison.

Left: A well-managed paddock of native grasses, showing a good covering.
Right: Overstocked area denuded of grasses.

in the paddocks for longer periods than would be the case with small paddocks of sown pastures, and then can be kept off the sown pastures in the event of over-grazing on these areas. It may also be desirable to save the sown pastures at times in order to ensure a supply of winter feed or succulent pasture for lambing ewes, sick animals, or for "topping off." When working on these lines, the movements of stock can be regulated to some extent by top-dressing. It is not sound practice, for example, to top-dress the small area of improved pasture and leave the natural pasture unmanured, as this tends to encourage grazing on the improved section. By top-dressing the natural pasture, the palatability and nutritive value are increased and the tendency is for the stock to utilise these pastures in conjunction with the sown pasture.

A system similar to the above is also desirable with grazing lucerne, as a balanced ration is provided, and the stock can be quickly moved onto the grass in the event of hoven, although liability to this trouble is decreased by the practice.

When arranging the disposition of watering-places, stock licks, &c., consideration should be paid to the wellbeing of the pastures, and these so placed as to avoid concentration of grazing on small patches as far as possible.

Top-dressing, particularly on herbage country, frequently results in a pasture composed almost entirely of clovers for a period, and where this occurs stock should have access to grass paddocks where the percentage of clover is small.

The Influence of Different Kinds of Stock.

Sheep are very selective in their feeding, preferring the low-growing fine plants and neglecting the tall-growing, coarse species. Over-grazing by sheep will therefore result in the "eating out" of the finer grasses and will encourage the development, seeding, and spreading of the coarser types.

Horses are "harder" on pastures than sheep, being even more selective in their grazing habits and concentrating on patches of the finer grasses until they eat these out. Pastures used entirely for horses will quickly revert to coarse grasses and other unpalatable pasture plants.

Cattle are less selective in their grazing than sheep or horses, and pay considerable attention to the coarser growth; advantage can be taken of this fact, and cattle used in conjunction with sheep or horses to maintain an even balance in growth between the fine and coarse plants in the pastures. "Stores" are naturally of more use in this connection than milking cows or fat cattle.

In tableland districts the natural pastures consist largely of coarse-growing grasses such as Native sorghum (*Sorghum plumosum*), Kangaroo (*Themeda Forskalii*), Tussocky Poa (*Poa caespitosa*), and finer grasses such as the Danthonias, clovers, and trefoils. To encourage and maintain the Danthonias and clovers, and check the spread of the coarse growers, both cattle and sheep should be used. Sheep cannot cope with the rough feed and cattle should be utilised for this purpose, to be followed later on by sheep. While the pastures are fairly heavily stocked with sheep, coarse grasses are controlled to some extent, but if spelled or lightly stocked they will re-assert themselves and cattle should again be used. Attention to this matter is imperative during the spring and summer months.

Top-dressing, by increasing clover growth and improving the palatability of the grasses, will greatly assist in controlling the growth of these pastures, and graziers should take advantage of this fact.

Overstocking and Understocking.

Over-stocking is probably the greatest contributing factor in pasture deterioration in New South Wales, for in many cases the over-stocking has been due to rabbits as well as stock, and this, combined with the effects of drought, has resulted in many pastures becoming denuded of the original covering of native grasses. Our uncertain seasonal conditions make it rather difficult always to be on the safe side with the number of stock carried, and occasionally trouble cannot well be avoided.

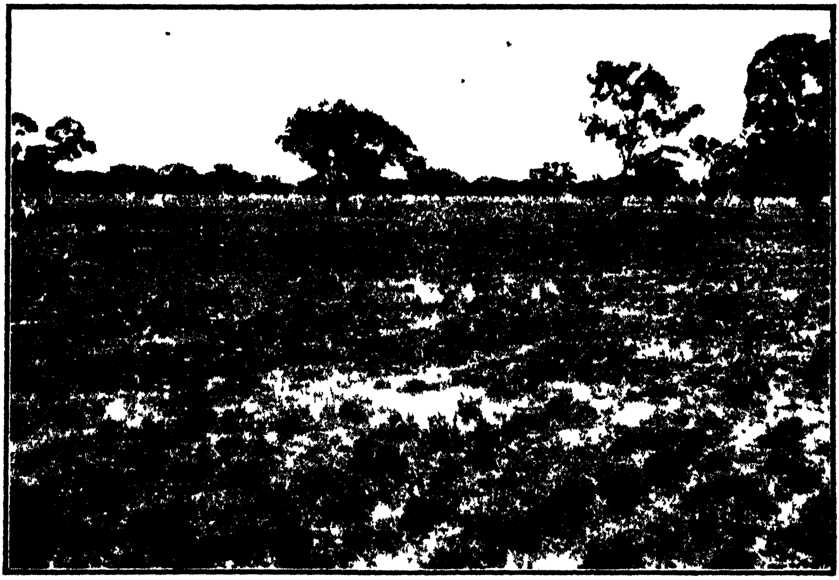


Fig. 4.—Native Grasses in the Boggabri District.

Paddocks of native grasses can be maintained in a similar condition to this by correct methods of stocking

Sown pastures may often be stocked at the rate of ten to fifteen sheep per acre without being overstocked, and so long as they are removed or the numbers reduced before the plants are nibbled too close, no harm will be done. If, however, this rate of stocking is persisted with, it will not be long before the most palatable species disappear, followed in time by the less palatable species. As the grasses and clovers become eaten out, unpalatable plants and weeds will obtain a hold, until finally they will assume control to the detriment of the area in stock-carrying capacity and drought-resistance. The dominance of the Wire or Three-awned Spear grasses (*Aristida* spp.) in some localities is due entirely to overstocking and drought.

Overstocking, particularly by close feeding animals such as sheep and horses, prevents the development of renewal shoots, and heavy grazing followed by dry weather will invariably result in many plants dying.

Continued overstocking of sown pastures is likely to lead to the stronger growers becoming dominant to the exclusion of the finer types and to loss of feed on account of the grasses seeding and becoming more or less harsh, unpalatable, and innutritious. Finally, weeds and annual grasses grow and seed unchecked and assume control

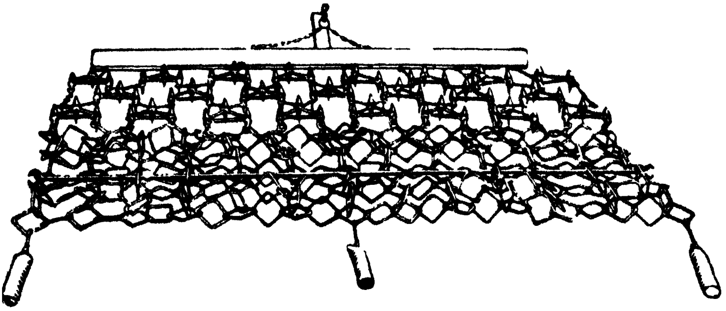


Fig. 5. A Suitable Type of Grass Harrow.

Pasture Treatments.

Harrowing the Pastures.—The importance of this work is not yet fully realised by landowners in this State. Harrowing is particularly necessary on sown pastures which are highly productive and heavily stocked. Heavy stocking consolidates the surface soil and harrowing should be carried out to break the crust formed, to aerate and sweeten the soil, allow rain to enter freely, and by the formation of a mulch conserve moisture. Animal droppings are also broken up and distributed. Pastures heavily stocked with cattle should be harrowed after each grazing period.

The value of stirring the surface soil of pasture land, even in comparatively dry districts, has been demonstrated during the past two seasons, and is strongly recommended as an adjunct to top-dressing. In tableland districts where pastures are not harrowed nor particularly well managed, the stand of grasses and clovers becomes sparse after some years, inferior grasses, weeds, and mosses eventually taking possession. Some old properties afford instances of this deterioration.

The value of cultivating grazing lucerne is recognised by most graziers, the work being carried out in the late winter. When Wimmera Rye grass is sown with the lucerne this practice is not desirable, as the grass will make prolific growth at that time and the cultivation would uproot many of the plants and destroy valuable grazing material. When these plants have been sown together it is advisable to forego the winter cultivation and to do the work in the late summer or early autumn, before the Wimmera rye seed germinates. This will provide a good seed-bed for the grass, encourage early growth, and leave the soil in a suitable condition to absorb autumn and winter rains for the benefit of the lucerne in the following spring.

Top-dressing.—Closely-grazed pastures require top-dressing periodically to maintain the supply of plant-foods which are removed in the form of wool, milk or meat. This aspect of pasture management is fully discussed in other Departmental publications.

Mowing.—Mowing the pastures should be practised to control the growth, more especially in coastal districts. The surplus material can be stored as hay or silage until required.

Grass Burning.—Although this is regularly carried out in a few districts, it is not a practice that can be generally recommended. With small paddocks and the use of both cattle and sheep it should not be necessary in any district. Where harsh, unpalatable grasses predominate and get out of control at certain seasons, burning may be carried out, but care should be taken to preserve the finer plants.

The Work in Coastal Districts.

Whilst the principles discussed under the various headings apply more or less to pastures in all districts, coastal pastures call for special attention, particularly where farms are small and grazing is intensive. The need on the coast is for smaller paddocks, together with the establishment of winter-growing grasses and clovers. It should be the aim of every dairy-farmer to provide paddocks of a size convenient for grazing in rotation, and to follow this up by top-dressing, harrowing, and mowing when necessary. Systematic handling of the paddocks to control excessive autumn growth will prolong the grazing season and ensure clover growth for winter pasturage, at the same time providing material for conserving as hay or silage. Winter grass and clover paddocks are essential to provide a change of feed from paspalum and to ensure good winter pasturage.

WHERE TO OBTAIN SODIUM CHLORATE.

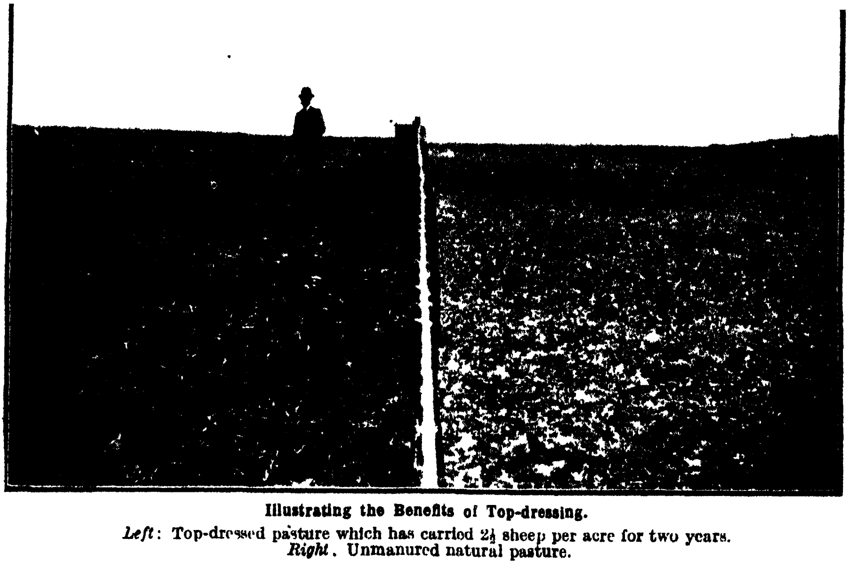
AFTER successful preliminary tests, the Department of Agriculture last year imported a considerable quantity of sodium chlorate in order that supplies would be available for those who wished to use it for weed control. This has been distributed throughout the State, and excellent results have been obtained, particularly in the control of St. John's Wort and Skeleton weed.

The value of sodium chlorate has now been demonstrated, and the usual suppliers of this class of material have made arrangements to fill requirements. The Department has no further supplies, and those requiring it should communicate with farm and station suppliers or wholesale chemists.

Pasture Improvement in the Bombala District.

L. W. McLENNAN, B.Sc. Agr., Assistant Agrostologist, and JOHN L. GREEN, H.D.A., Agricultural Instructor.

DURING the last few years considerable progress has been made in pasture improvement work in the Bombala district. Departmental experiments and trials conducted privately have yielded much information that have made possible the recommendation of reliable means by which the carrying capacity of pastures may be increased. The best results have followed the sowing of pasture mixtures, the sowing of lucerne for grazing, both on hillsides and flats, and the top-dressing of pastures with superphosphate.



Illustrating the Benefits of Top-dressing.
Left: Top-dressed pasture which has carried 2½ sheep per acre for two years.
Right. Unmanured natural pasture.

Trials at Bombala.

Mr. F. J. Smith, of Redbank, Bombala, commenced pasture improvement work in the winter of 1924, when he top-dressed a 40-acre hill paddock with superphosphate at the rate of 1 cwt. per acre. This paddock carried two and a half sheep per acre until top-dressed again in June, 1929. During this period a check paddock (not top-dressed) carried only one and a quarter sheep per acre. There had been a very obvious thickening up of the pasture in the top-dressed paddock due chiefly to a remarkable increase in clover growth. The finer grasses, such as wallaby grass, panic grasses, love grasses, &c., had also increased at the expense of tussocky poa, spear grass

More . . . and Better Grass

PASTURE improvement precedes pasture top-dressing, because the best pastures pay handsomely for the best treatment. You can INVEST more money in top-dressing, and obtain a better DIVIDEND . . . . and this quite irrespective of the kind of farming you carry on.

The addition of NITROGEN to Superphosphate is the latest development in grassland farming, and foremost farmers in all districts of good rainfall, or where irrigation is practised, are realising the advantages of

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Here is the opinion of a Victorian farmer who has just completed a trial:—

> "Results have astonished me, for the two plots treated with Super and Sulphate of Ammonia have carried exactly double the stock that the plot treated with Super only has carried."

Literature on Pasture Improvement from

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CUT the COST of PRODUCTION
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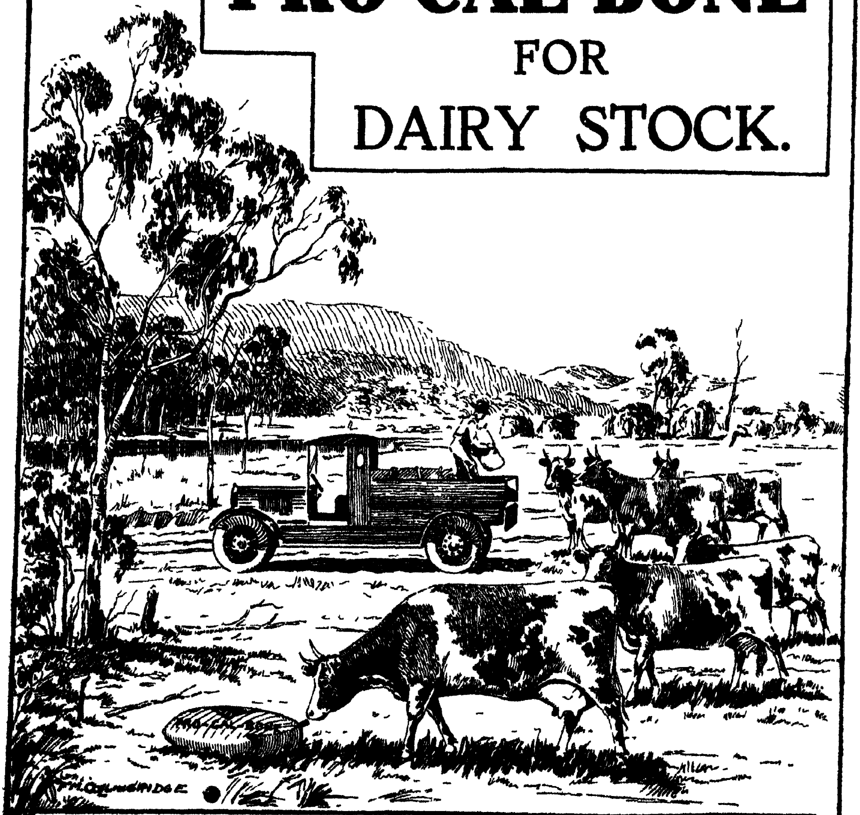
PRO-CAL-BONE
FOR
DAIRY STOCK.



M.I.B. PRO-CAL-BONE: A Protein plus Calcium Concentrate which aids Milk Production and prolongs the lactation period. Prevents Bone Chewing, and maintains constitutional vigour in Dairy Stock.

Write for Booklet:—

METROPOLITAN MEAT INDUSTRY BOARD,
State Abattoir, Homebush Bay, N.S.W.

and snow grass. The improved types of pasture plants provided a better ration, the benefits of which were reflected in the health and development of the stock.

From September, 1928, to March, 1929, a very dry period, this hill paddock of 40 acres carried a hundred ewes and seventy-five lambs. In March, 1929, the lambs were removed, and from then until the middle of October, 1929, a hundred sheep were carried. These were then replaced by seventy-three stud ewes which remained in the paddock until the end of the year, and though they fattened they were unable to keep the grasses and clovers eaten down. More sheep were put into this paddock in January and February, 1930, as well as cattle, to eat the tall feed. Mr. Smith states emphatically that top-dressing with 1 cwt. superphosphate every three years has more than doubled the carrying capacity of native pasture, and intends top-dressing a further 200 acres as soon as possible.

Stack of Grass Hay on Mr. Smith's Property.

In 1924 a 5-acre paddock was sown with 4 lb. Subterranean clover per acre, the seed being mixed with superphosphate and sown on the surface by means of a manure spreader. Owing to dry, windy conditions, results were rather disappointing at first, but since 1926 growth has been abundant. This is characteristic of Subterranean clover which usually takes about two years to become established when sown broadcast. Now (in 1930) the clover forms a dense mat of feed over the paddock. Mr. Smith estimates that the carrying capacity since 1926 has been four sheep per acre. Prior to August, 1929, the paddock was used for rams. From then until early

October it carried thirty sheep, after which it carried thirty-seven until January, 1930. Stocking this year has been at the rate of five to seven sheep per acre. This paddock has been top-dressed twice since sowing.

On 3rd April, 1929, a 15-acre paddock was sown with the following mixture:—Wimmera Rye grass, 5 lb.; Giant Fescue, 3 lb.; Cocksfoot, 3 lb.; Subterranean clover, 3 lb.; and lucerne, 2 lb. The seed was mixed with superphosphate, and sown by means of a fertiliser distributor. Germination and growth were good. At the end of 1930 Wimmera Rye grass and Subterranean clover predominated, though lucerne and other grasses had become scattered throughout the pasture. The abundant growth enabled 7.5 sheep per acre to be carried from August, 1929, to April, 1930. In November, 1929, growth was becoming rank and fifteen head of cattle were put into the paddock. These made little impression and were removed after a week because of difficulty in watering. Without allowing for seventy ewes and lambs which grazed in this paddock three hours daily for two weeks in June, the carrying capacity for the year ending 12th August, 1930, was 5.1 sheep per acre. In December, 1929, 7 tons of high quality grass hay were cut without removing the stock.

Lucerne Growing on Steep Hillside on property of Mr. F. J. Smith, "Redbank," Bombala.

Mr. Smith has been particularly successful with lucerne, both on hills and flats. He has demonstrated that this plant will withstand heavy grazing through long, dry periods as well as yielding several cuts of hay during favourable seasons. An area of 10 acres growing on a steep hillside is cut three times a year, and has averaged 1 ton per acre per cut. In the autumn and winter, when conditions are unsuitable for haymaking, the lucerne is heavily grazed.

Top-dressing Native Pastures and Sowing Pastures at Cathcart.

Mr. J. B. Sautelle, of Hilstead, Cathcart, *via* Bombala, is thoroughly satisfied with the result of all pasture improvement work that he has attempted on his Hilstead property, situated 10 miles from Bombala and 40 miles from Bega. He now enthusiastically recommends top-dressing of native pastures and the sowing of pasture mixtures as sound economic propositions on southern Monaro.

Showing Variation in Growth of Pasture due to Uneven Distribution of Superphosphate.

In May, 1929, 100 acres of flat country were top-dressed with superphosphate at the rate of 1 cwt. per acre. The rotary distributor used spread the fertiliser unevenly, applying a much heavier dressing directly behind the machine than elsewhere, with the result that in the spring, parallel strips of dark-green pasture appeared across the paddock. Between these areas the grass was brownish in colour, and there was much less clover; and the feed on these portions was neglected by stock. In an adjoining 100-acre, unmanured check paddock, the pasture was much thinner; there was more coarse grass, less herbage, and very little clover. During the spring the clovers in the top-dressed paddock (chiefly White, Burr and Ball clovers) increased by 200 to 300 per cent., whilst there was also a considerable increase in crowfoot and other herbage.

Records of the stock carried on manured and unmanured paddocks kept from August, 1929, to August, 1930, showed that the former averaged 2.95 sheep per acre compared with 1.04 per acre on the unmanured paddock.

The improvement in health, growth and condition of stock on the top-dressed area was very marked. In fact the development of improved pastures rendered possible the establishment of a dairy.

Results from sown pasture mixtures have been equally promising. An area of 4 acres sown with 3 lb. Subterranean clover and 3 lb. Perennial Rye grass per acre in May, 1927, cut 2½ tons of excellent grass hay in December of the same year. Twenty Romney Marsh ewe hoggets were then carried for six months. At the end of that period they were in prime condition and almost twice as big as the paddock-run sheep. Since then this paddock has carried an average of five sheep per acre as well as yielding an occasional cut of grass hay.

A 2-acre paddock of better soil sown at the same time with the same mixture as above has carried six sheep per acre for three years. Both of these paddocks, which were top-dressed in 1929 with 1 cwt. superphosphate per acre, are now in excellent condition and promise to maintain a high carrying capacity indefinitely.

The results obtained by Mr. Sautelle prove conclusively that, by the top-dressing of pastures in association with the sowing of pasture mixtures, the whole of the Cathcart flats can be converted from a sheep and a half to the acre grazing land into fattening country that will carry five sheep per acre, or into good dairying country, and that the carrying capacity of ordinary grazing land can be more than doubled by the application of 1 cwt. of superphosphate every two years.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1931.

Wollongong (W. J. Cochrane) ...	Feb.	5, 6, 7
Liverpool (B. C. Fitzpatrick) ..	,,	6, 7
Leeton (W. Rosewarn)	,,	11
Nowra (H. Rauch)	,,	12, 13, 14
Castle Hill (E. Black)	,,	13, 14
Wyong (F. Akhurst)	,,	13, 14
Milton (Rev. S. A. Turner)	,,	18, 19
Newcastle (P. Legoe)	,,	18 to 21
Kangaroo Valley (L. W. Vance)	,,	20, 21
Granville (B. Hyslop)	,,	20, 21
Pambula (L. K. Longhurst) ...	,,	20, 21
Maitland (M. A. Brown) ...	,,	25 to 28
Coonabarabran (L. Byrne) ...	,,	26, 27
Gunning (G. E. Ardill)	,,	26, 27, 28
Blacktown (A. J. Greenaway) ...	,,	27, 28
Robertson (W. G. Jenkin) ...	,,	27, 28
Taralga (W. N. Fitzgibbons) ...	Mar.,	3, 4
Braidwood (H. E. Roberts) ..	,,	4, 5
Bellingen (J. F. Reynolds) ...	,,	4, 5
Moss Vale (W. Holt)	,,	5, 6, 7
Penrith (C. H. Fulton)	,,	6, 7
Bowraville (R. H. Usher) ...	,,	10, 11
Mudgee (T. P. Gallagher) ...	,,	10, 11, 12
Cooma (G. E. Metcalfe)... ...	,,	11, 12
Crookwell (A. G. McDonald) ...	,,	12, 13, 14
Gresford (A. R. Brown)... ...	,,	13, 14
Bowral Horse Show (E. Waine)	,,	13, 14
Campbelltown (R. A. Sidman)...	,,	13, 14
Rydal (H. Murray)	Mar.	13, 14
Wingello (J. S. Creelman) ..	,,	14
Nimbin (S. H. Kilmister) ..	,,	18, 19
Macksville (G. Hughes)	,,	18, 19
Dungog (W. H. Green)	,,	18, 19, 20
Lithgow (E. L. Parker)... ..	,,	19, 20, 21
Camden (G. V. Sidman) ...	,,	19, 20, 21
Goulburn (T. Higgins) .. .	,,	19, 20, 21
St. Ives (A. Pickering)	,,	20, 21
Batlow (C. S. Gregory)	,,	24, 25
Gloucester (L. Harris)	,,	25, 26
Muswellbrook (R. C. Sawkins) ...	,,	25, 26, 27
Brookvale...	,,	27, 28
Sydney Royal (G. C. Somerville)	Mar. 30 to April 8	
Kempsey (E. Mitchell)	April	15, 16, 17
Orange (G. L. Williams) ..	,,	21, 22, 23
Grafton	,,	22 to 25
Richmond (R. B. Tate)... ...	,,	23, 24, 25
Casino (E. J. Pollock)	May	5, 6, 7
Peak Hill (W. Crush)	Aug.	4, 5
Trundle (W. P. Forrest) ...	,,	18, 19
Condobolin (J. M. Cooney) ...	,,	25, 26
Wagga (F. H. Croaker)	,,	25, 26, 27
Bogan Gate (J. T. A'Beckett) ...	Sept.	2
Berrigan (R. Wardrop)	,,	30
Junee (G. W. Scrivener) ...	,,	22, 23
Narrandera (J. D. Newth) ...	Oct.	6, 7

Lucerne Breeding.

R. E. DWYER, B.Sc.Agr., Assistant Plant Breeder.*

LUCERNE has attained a pre-eminent position as a fodder crop in Australia, and the acreage devoted to this crop is showing a decided increase each year. Though it does best on rich alluvial soils, its value as a grazing crop on poorer soils and under drier conditions, where thinner seedings are used, is now being realised. Lucerne growing is now extending rapidly on our typical wheat soils where the rainfall is over 20 inches. In New South Wales the area under lucerne on the Western Slopes and Plains has increased from 40,821 acres to 86,300 acres, and on the Tablelands from 26,777 acres to 67,440 acres during the past ten years. With this rapid extension of lucerne growing in colder and drier districts there is a definite need for the development of types and strains which are more suited to these different climatic conditions.

The close inspection of any lucerne field readily reveals the vast possibilities for improvement in this crop. Marked variations exist between individual plants in the habit of growth, size and vigour of plants, leafiness, coarseness, flower colour, &c., and in numerous other morphological characters.

Improvement work with lucerne demands a long and painstaking programme and the application of advanced breeding technique. Lucerne is largely a self fertilised plant, though some cross-fertilisation occurs, and seed which will produce vigorous plants of high uniformity is difficult to obtain.

Our local strains of Hunter River and Tamworth lucerne show markedly superior growth during our less rigorous winters to cold climate lucernes from most other countries. Over seventy varieties and strains have been introduced from widely-scattered countries, such as Argentine, France, United States of America, Spain, Austria, South Africa, Turkestan, and Egypt during the past two years. So far it appears that few, if any, of these introductions will prove superior to our local strains at Bathurst Experiment Farm.

In commencing lucerne improvement work at Bathurst Experiment Farm several hundred individual plants obtained from established fields in the district were selected and transplanted into a small area for careful comparative observation, and selections from apparently superior plants in the introduced varieties were similarly treated. After detailed observation, careful elimination was carried out, and about eighty of the best selections were carefully divided into five plant clonal divisions and planted out.

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* Paper read before the Agricultural Section of the Australian Association for Advancement of Science Conference, Brisbane, 1930.

The first task is to secure self-fertilised seed from these selected plants or "clonal strains." If the seed from any one of these selections gives a vigorous, highly uniform progeny similar in type to the mother plant or clone, the basis of an improved strain of lucerne will at once be provided. It is most likely, however, that there will still be a more or less marked variation in the progeny—probably nearly as great as that in the field from which the original plants were selected. The best plants of this progeny must therefore be selected and again self-fertilised, and this seed again tested for vigour and uniformity. This selection in self-fertilised lines must be continued until the desired objective is obtained.

Various methods have been used at Bathurst to prevent cross-pollination of the flowers by insects and to ensure self-fertilisation. Muslin-covered wooden or iron frames were used in some cases to cover the whole plant. These should preferably be provided with movable covers for convenience, as each individual flower-head sometimes requires to be mechanically tripped. This is carried out by lightly pressing with the fingers in order to ensure pollination and proper fertilisation, and thus a good setting of seed. The chief method used last season was the bagging of flower-heads in ordinary transparent glassine bags before the flowers opened. The flowers were tripped by lightly pressing through the bags without removing them, and a good setting of seed resulted in all cases. Seed equivalent to self-fertilised seed has also been obtained from open pollinated clonal plants, all the surrounding strains and isolated plants having been cut back when near flowering.

With a limited amount of seed from these self-fertilised lines, it has been found advisable to sow in a seed-bed and transplant the progeny, uniformly spaced in a row, for close observation. In the few selfed lines already under observation at Bathurst, a certain loss of vigour is apparent, but the individual plants are distinctly uniform in type. This reduction in vigour is more marked in some lines than in others. Opinions vary as to the relative loss in vigour due to self-fertilisation in this crop. The bulk of the evidence suggests that in most cases there is a distinct reduction in vigour, but in some self-fertilised lines the vigour is maintained. Automatic tripping of the flowers is also natural in some lines under certain conditions, and these require no artificial agency for fertilisation. Further work is necessary to determine how common this is under New South Wales conditions.

The work of lucerne breeders in some other countries provides some hope that when a large number of individuals are artificially self-fertilised some useful improved agronomic types may be obtained which will retain their original vigour with continued selfing. If loss of vigour proves an invariable rule, re-combinations of similar selected self-fertilised strains (*i.e.*, ecotypes having similar characteristics) will be necessary to evolve improved strains.

In addition to possessing other desirable characteristics, an improved strain, to be of any commercial value, will have to be a good seeder. From the observations already made, it has been seen that wide variations exist in the seeding propensities of individual plants. It has been found that plants with tall, wiry stems and sparse leaves are the best seeders, whilst many leafy vegetative plants are poor in this respect, but obviously plants of the latter type with at least a satisfactory natural set of seed are desired.

A wide field is open to investigators to determine the factors—such as climate, soil conditions, insects, and variations in the natural seeding ability—which govern seed production, and work is being initiated in this direction. A study of the insect population and the main agents involved in the tripping and cross-fertilising of lucerne is also being taken up in conjunction with the Entomologist at Bathurst Experiment Farm.

The existence of a disease causing the production of dwarfed plants with a large proliferation of very fine spindly stems, and often killing the plants, is providing a serious handicap in this work at Bathurst. This disease is being investigated by the Biologist, but so far no causal organism has been found.

Lucerne breeding is a comparatively new project in New South Wales, and has already expanded considerably at Bathurst Experiment Farm. The comparatively advanced progress already made at Bathurst is to a large extent due to the valuable co-operation and advice of Mr. R. G. May, manager of the Bathurst Experiment Farm, who early foresaw the possibilities of improvement with this crop. In practically no part of the world has lucerne breeding proceeded yet very far beyond the investigational or experimental stages, and in Australia the way is being pioneered by the New South Wales Department of Agriculture.

A word of warning must be given at this stage against unscrupulous firms who are advertising new strains of lucerne for sale, and who have only selected roots or plants to dispose of. Such superior plants can readily be found by any lucerne grower in his own field and can be readily transplanted, but the evolution of a superior strain of lucerne which will come true from seed has not yet been known to have been done in Australia. From what has been written in this paper, this is not likely to be achieved except by painstaking work for several years along the lines indicated.

Summary.

The culture of lucerne has extended rapidly during recent years on upland soils in drier and colder districts on the Western Slopes and Tablelands of New South Wales. It is now largely grown as a grazing crop on typical wheat soils, where the rainfall is over 20 inches. With this rapid extension of lucerne growing into different climatic and soil conditions, there has arisen a definite need for the development of breeding of types and strains which are adapted to these conditions.

The close inspection of lucerne fields readily reveals marked variations between the individual plants in habit, leafiness, type, and vigour of growth, &c., and the aim of the breeder is to secure a strain which will uniformly reproduce the type and vigour of the best plants in such a field. This cannot be done simply. Lucerne is to some extent cross-fertilised, and the selection of seed from the best individual plants in a field will only reproduce the heterogeneous types of which the original field is composed.

Continued selection in self-fertilised lines is regarded as the best basis of improvement, and the experience with this method at Bathurst Experiment Farm during the past three or four years is given.

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with the view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected orange buds to nurserymen during the 1930 budding season, trees from which should be available for planting during the 1931 planting season :—

	Buds of Washington Navel.	Buds of Late Valencia.
T. Adamson, Ermington	3,000	3,000
W. Beck, Epping...	1,000	1,000
A. T. Eyles, Rydalmere	3,000	2,000
J. de Freitas, Fairfield	200	200
R. Hughes, Ermington	1,000	1,000
L. P. Rosen and Son, Carlingford	5,000	1,200
B. E. Yarnall, Ourimbah	100	100

—C. G. SAVAGE, Director of Fruit Culture.

INFECTIOUS DISEASES REPORTED IN NOVEMBER.

THE following outbreaks of the more important infectious diseases were reported during the month of November, 1930 :—

Anthrax	6
Blackleg	9
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	8
Swine fever	Nil.
Contagious pneumonia	Nil.

—**MAX HENRY, Chief Veterinary Surgeon.**

Lettuce Growing.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

THE lettuce is one of the most popular salad vegetables and is widely grown over the whole of New South Wales. The Sydney market, which is naturally the best, is mainly supplied from the metropolitan area; Botany, Miranda, Bankstown and the northern suburbs produce the bulk of supplies. A relatively small quantity is supplied from the near South Coast and from centres as far north as Wyong.

Lettuce growing is most profitable where advantage is taken of the markets and the grower familiarises himself with the methods of production most suited to his own district. The majority of vegetable-growers adopt a rotation into which they fit the lettuce crop each year. Spring lettuce are very popular in Sydney, arriving on the market just before the tomato crop. This planting of lettuce is usually followed by rock-melons, the seed of which is usually planted amongst the growing lettuce. Crop rotation is essential with this crop, which, because of its nature and the fact that the nitrogenous manures generally used result in a forced tender quick growth, is subject to the attacks of insect pests and diseases.

The low-lying districts that are subject to frost grow excellent summer lettuce, while the relatively frost-free districts supply the winter market. Temperature, soil conditions and moisture are important considerations. The crop thrives where the temperatures are uniformly low but frost free, and where hot weather is not experienced, particularly when the plants are hearting. While soil conditions are capable of modification, and moisture can be regulated, the control of temperature is beyond the influence of the grower and is therefore the limiting factor in the growing of lettuce.

Varieties.

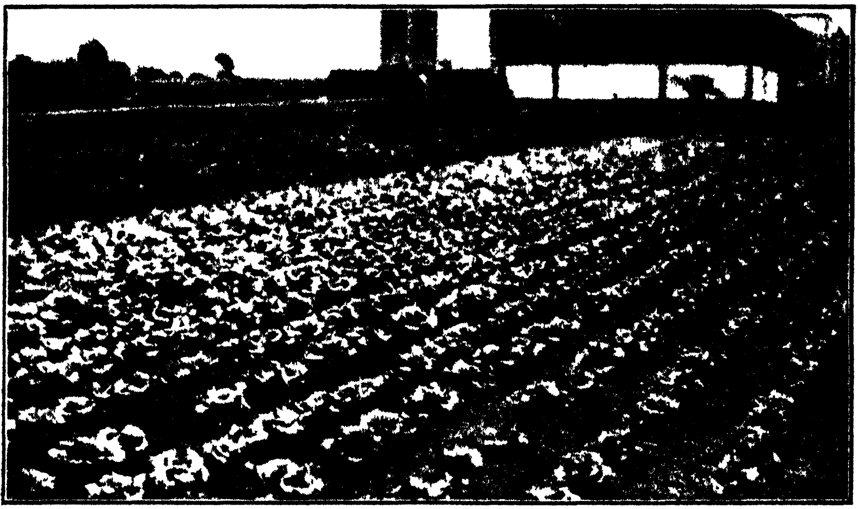
The Sydney market demands a firm-hearted lettuce at all seasons of the year. The loose-leaf varieties have been found to deteriorate rapidly and do not stand up to handling during marketing. Smooth leaf, butterhead varieties are also very unpopular both with growers and buyers. Growers find that these types do not give the same results as the curly leaf, large hearting types and are more susceptible to injury from insects, diseases, and adverse seasonal conditions. Cos lettuce, a long-leaf type, has never been in favour on the New South Wales markets, although it is considered a good type for the home garden. The Sydney public prefers a light green lettuce in the summer months and a dark green lettuce in the winter.

Champion Cabbage and *Iceberg,* which are practically identical types, are commonly grown around the metropolitan area for spring and winter crops. This type is a large, heavy hearting lettuce, showing a red margin on the leaves.

Webb's Wonderful, Neapolitan, and *New York* are similar types. They belong to the dark leaf varieties and are very suitable for winter growing.

Mignonette is a cabbage head type, a little on the small side, but suitable for the hotter portions of the State. At Wollongbar Experiment Farm, on the Richmond River, Mignonette sown during January formed up solid hearts. This variety has also given excellent results under western conditions. In the metropolitan area, however, it is looked upon as a home garden variety only.

Growers are strongly advised to allow a few heads of the best plants in the bed to go to seed each year with the object of preserving any desirable types.



The Single Row System.
All except the three rows nearest the camera have been mulched with tan bark.

Raising Lettuce Plants.

In cold districts it may be necessary to raise early plants under cover in order to protect them from frost. Under all circumstances be careful to allow the plants plenty of ventilation during the day, otherwise they will become spindly and weak.

Where the practice is to sow the seed in rows in the field and later thin out the plants, about 2 lb. of seed will be necessary, but where the seed is sown in beds and the seedlings transplanted into the field, only about ½ lb. seed per acre is required. A defective germination is often obtained with lettuce seed, particularly in the case of imported seed. Sydney growers have come to recognise this, and as a rule produce their own seed and obtain excellent results even when it is two years old.

The seed bed should be well prepared and lightly dusted with a little superphosphate and sulphate of ammonia, together with decayed organic matter. The superphosphate helps root development in the seedlings.

About 900 square feet of seed bed is necessary to plant ½ lb. of seed. Plant the seed in rows at least 2 inches apart. Under ordinary circumstances the seedlings will be ready to transplant in two to three weeks. One of the secrets of lettuce growing is to have rather big, sturdy plants.

Soil Preparation and Field Work.

The soils around Sydney are very poor as a rule and require a good deal of building up by the incorporation of manure or green crops. Early deep cultivation, either by hand or by ploughing, is necessary to bring the soil into good tilth and hasten the decay of organic matter. Frequent harrowings are also necessary to fine down the soil in the beds. If the bed system of growing is to be adopted, or the furrow method of planting to be carried out, the necessary arrangements for drainage should be made before the seedlings are transplanted.

The method of laying out the lettuce beds will depend on the locality and the choice of the individual grower. The favourite method is to build slightly raised beds containing six rows about 1 foot apart, the plants being spaced 9 inches apart in the rows. When the seed is planted directly into the field with a seed dropper the rows are spaced from 18 inches to 2 feet apart and are worked either with a hand or horse cultivator. Some growers put two rows 15 inches apart and leave a space of 2 feet between the double rows. It is necessary to thin out the plants when seed is planted directly in field.

Transplanting is a tedious operation that requires a little practice before the grower becomes proficient. The crowns of the plants should never be buried; shallow planting, followed by overhead irrigation has been found to give best results. After transplanting, the beds are generally mulched with some suitable material—rotted cow manure is excellent, and tan bark is extensively used.

Irrigation.

Early overhead irrigation is essential in order to give the plants a good start. Once the plants are established, light waterings only are necessary until a few days before planting, when heavy waterings can again be given with advantage. Mr. W. Cole, of Wellington, uses the furrow method of irrigation with marked success, the water being run down in furrows between each row of plants. Most growers favour overhead irrigation, claiming that it gives a more even distribution of water, and, to some degree, keeps the heads free of aphids, dust, &c.

Manures and Fertilisers.

Lettuce being a quick-growing, leafy crop, requires an abundance ot humus, water, and nitrogenous manure. Heavy dressings of animal manure are necessary under all New South Wales conditions; dressings of from 20 tons to 40 tons per acre are not considered excessive. It is hardly necessary to mention that the organic manure should be well decayed in order to destroy any weed seeds it contains and to break down the straw, &c. It is found that long straw encourages insect pests such as wood bugs and slugs.

Artificial fertilisers are not generally used when the previous crop, which is usually cauliflowers, has been heavily manured with a fertiliser mixture containing bonedust. There is a feeling among growers that superphosphate causes the spring crop to run to seed. This is sometimes the case when the supply of organic manure has been light, the water supply poor, and the superphosphate used alone. Superphosphate produces early maturity of most crops, and may be responsible for the plants running to seed. Moreover, lettuce do not like an acid soil, and perhaps the acidity created by heavy irrigations, lack of cultivation, and the use of heavy dressing of organic manure and superphosphate may be injurious under certain circumstances.

When the land has been well supplied with organic matter it is found that a mixture consisting of two parts superphosphate and one part sulphate of ammonia will give excellent results. Lime is not required except under certain conditions. Mr. E. Buckland, of Helensburgh, has a garden situated in a peat swamp, and this soil sours very easily. It was found in this case that lime corrected the acidity of the soil and enabled lettuce to thrive where previously they turned yellow. Where the soil conditions are good, however, lime is not required as it tends to liberate the nitrogen content of certain fertilisers.

Top-dressings of nitrogenous manure, either in the form of poultry manure or as sulphate of ammonia, are practically essential to bring the crop to perfection. As many as three dressings are carried out by the best growers.

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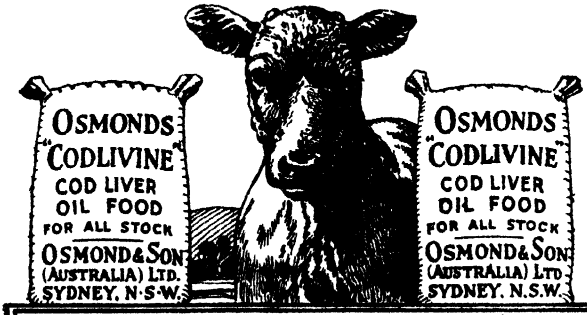

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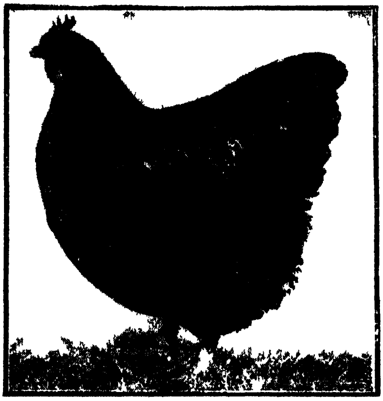

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G. D. ROSS, Under Secretary,
Department of Agriculture,
SYDNEY.

Experiments in Cabbage Moth (*Plutella maculipennis*) Control, 1930.

W. L. MORGAN, B.Sc.Agr., Assistant Entomologist.

THE experiments carried out in 1928-29 (see *Agricultural Gazette*, October, 1929) pointed to the double treatment of the plants each week with arsenate of lead spray and lime and tobacco dust being the most promising. The 1930 experiments were designed to further test the value of this double treatment and also the value of arsenical dusts.

Calcium and lead arsenates at strengths of 10 per cent. and 20 per cent. in a hydrated lime filler had previously given unsatisfactory control; the dusts were mixed and sieved somewhat roughly in the laboratory and applied by means of a cheese cloth bag, rotary blower or hand bellows. The percentage of arsenicals in these dusts may have been too low to give satisfactory results while their comparatively coarse mechanical composition and the unsuitable means of application decreased their efficiency very considerably. Proprietary dusts and machines (intermittent blowers) specially adapted for applying these dusts have recently been placed on the market. The dusts are so finely divided as to pass through sieves of 200 meshes to the inch, and a blast from the blower produces a cloud of dust which envelops the plant, depositing a fine film of dust over the leaves. These dusts were used in the 1930 experiments. Some 1,200 cauliflowers were treated, the results of which are summarised below. The treatments were applied at weekly intervals.

Treatment	*Percentage of Plants Marketed.*
50 per cent. arsenate of lead dust	78.70
75 per cent. arsenate of lead dust	85.19
30 per cent. calcium arsenate dust	31.50
50 per cent. arsenate of lead dust, alternated each week with 2½ per cent. nicotine dust	51.51
2½ per cent. nicotine dust	18.93
Arsenate of lead spray and lime and tobacco dust	21.18
Untreated check	0.00

From the sections treated with 75 per cent. and 50 per cent. lead arsenate dusts, 85.19 per cent. and 78.70 per cent. of the heads, respectively, were cut, only 21.18 per cent. from the plants treated with arsenate of lead spray and lime and tobacco dusts, whilst none was cut from the untreated check. Another test on a small patch of 400 plants gave similar results in favour of the arsenical dusts.

The cost of materials for the ten treatments in each case was as follows:—

Treatment.	*Cost per Plant for 10 applications.*
Arsenate of lead dust 50 per cent	.58d.
Arsenate of lead dust 75 per cent	.78d.
Arsenate of lead spray with calcium caseinate spreader and lime and tobacco dust	.30d.

Whilst the cost of materials for dusting is high, the advantages of this method, apart from the increase in yield, are the ease and rapidity with which the dust may be applied at any period of the day.

As a result of these experiments commercial growers are advised to use either a 50 per cent or a 75 per cent. arsenate of lead dust once a week for control of cabbage moth during the forthcoming season. For seed bed treatment a 2½ per cent nicotine dust applied every one to two days according to the degree of infestation is useful. Dusting with arsenicals should cease a month before cutting owing to possible danger of poisoning to consumers; if necessary a nicotine dust may be used in place of arsenicals at this late stage.

SUPPLY HUMUS BY GREEN MANURING.

AMONG the most effective methods of supplying humus to the soil and increasing its fertility is the practice of green-manuring, that is, the growing and ploughing under of a green crop The beneficial action of this operation is a twofold one it enriches the soil, in the first place, by supplying it with a considerable proportion of readily-available plant-food, and, in the second place, by adding humus and thus improving the soil's texture and its power of absorbing and retaining moisture Green manuring is effective both in sandy and in heavy clay soils, and, indeed, on all soils deficient in humus. On sandy soils the effect of green-manuring is to consolidate the soil, the humus formed binding the particles together On clay soils, the effect of the addition of humus (and the production of carbonic acid) is to loosen and aerate them.

POSSIBLE METHODS OF WHITE ANT CONTROL.

THE growing demand for control of pests by biological methods, *i.e.*, the use of parasites and predators, writes G. F. Hill in the *Journal of the Council for Scientific and Industrial Research*, has been suggested as a simple and inexpensive means of eradicating termites, but it might be stated quite definitely that, whilst this field of investigation is not being overlooked, the possibility of ever obtaining relief in this direction is extremely remote It is considered that eradication or reduction to negligible numbers is a practical impossibility, and that the solution of the problem of termite damage lies in the adoption of effective preventive measures in building construction, wood preservation methods, possibly soil poisoning, and such other chemical and mechanical methods as are required to meet particular cases.

THE imports of tung oil into the United States (mostly from China) were valued at £2,510,000 in 1924, £2,857,000 in 1925, £1,882,000 in 1926, £2,429,000 in 1927, and £2,756,000 in 1928.

Feeding Pigs on Maize Rations.

AN EXPERIMENT AT HAWKESBURY AGRICULTURAL COLLEGE.

F WHITEHOUSE, B.V.Sc., Veterinary Surgeon, Stock Branch, and F. BOSTOCK, Piggery Instructor, Hawkesbury Agricultural College.*

AN experiment was commenced at Hawkesbury Agricultural College on 13th September, 1929, in which pigs were fed from the weaning stage till of bacon weight (January, 1930) on three different rations, each containing maize. It was laid down that the rations were to be on a 30 lb. basis, and to be proportionately increased as the weight increased. This, of course, resulted in totals of digestive nutrients not in accordance with those usually adopted, and in the maintenance of a constant nutritive ratio. A comparison of the total digestible nutrients as fed in the experiment and those advocated by Henry and Morrison is interesting.

	Live Weight of Pigs.	Total Digestible Nutrients.	
		Experiment.	Henry and Morrison.
	lb.	lb.	lb.
Lot (1)—			
At commencement ...	50	2·54	2·27
At conclusion ...	175	6·75	4·76
Lot (2)—			
At commencement ...	40	1·94	1·72
At conclusion ...	175	6·25	4·76
Lot (3)—			
At commencement ...	30	1·57	1·23
At conclusion ...	175	6·27	4·76

Eleven pigs were used in each lot, the animals available being divided into lots according to weights. The range of weights in each lot was very small, thus effectively preventing bullying at the troughs.

At the commencement of the experiment, Lot I consisted of six crossbred pigs, four Tamworths and one Berkshire, with an average weight of 48.54 lb. and an average age 86.81 days; Lot II of eight crossbred pigs, one Tamworth and two Berkshires, with an average weight of 40.18 lb. and an average age of 74.63 days; Lot III of five crossbred pigs, two Tamworths and four Berkshires with an average weight of 32 lb. and an average age of 75.63 days.

The pigs were run in bare yards, in each of which an open-fronted shelter shed was provided, which unfortunately contained no wooden floor. The soil in each yard was of a sandy loam providing good drainage. The pigs were ear-marked and weighed individually once a week in a standard crate on a spring balance.

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* Report of an experiment carried out at the direction of the departmental sub-committee dealing with feeding experiments—Messrs. McDonald, Henry, Southee, Grant, and Gray.

The Rations Fed.

The basic rations were respectively:—

Lot I.—Maize 1.1 lb., separated milk 4 lb., green wheat 0.75 lb.; nutritive ratio of 1 : 4.8.

Lot II.—Maize 1 lb., meat meal 0.0625 lb., separated milk 3.5 lb., green wheat 0.75; nutritive ratio of 1 : 4.3.

Lot III.—Maize 0.75 lb., bran 0.25 lb., pollard 0.25 lb. meat meal 0.0625 lb., separated milk 3 lb., green wheat 0.75 lb.; nutritive ratio of 1 : 4.1.

In arriving at suitable rations the percentages of digestive nutrients shown for the constituents of the ration in *Feeds and Feeding*, by Henry and Morrison, were used.

In each lot the maize was fed dry, and the remainder of the ration fed in combination, the whole given as one feed in the morning. The pigs were in bare lots and each pig received in the afternoon 0.75 lb. of green wheat, which, however, ran out on the 14th October, 1929, and was replaced by a similar amount of green lucerne per pig per day. Fresh water and coal cinders were accessible at all times.

The following three tables indicate the actual quantities of constituents fed, the dates of the increases being shown in the left column:—

RATIONS Fed.—Lot I.

Date	Maize	Separated Milk	Green Feed	Total Digestible Nutrients	Nutritive Ratio 1 :
	lb.	lb.	lb.	lb.	
13th September, 1929 ...	20	73	8·5	2·54	4·8
28th September, 1929 ...	24	88	8·5	3·02	4·8
12th October, 1929	28	102·5	8·5	3·49	4·8
14th October, 1929	28	102·5	8·5	3·43	4·7
2nd November, 1929 ...	36	132	8·5	4·38	4·7
14th November, 1929 ...	40	146·5	8·5	4·86	4·7
28th November, 1929 ...	44	161	8·5	5·33	4·7
12th December, 1929 ...	48	175·5	8·5	5·81	4·7
19th December, 1929 ...	52	190	8·5	6·28	4·7
2nd January, 1930	56	204·5	8·5	6·75	4·7

RATIONS Fed.—Lot II.

Date.	Maize.	Separated Milk.	Meat Meal.	Green Feed.	Total Digestible Nutrients.	Nutritive Ratio, 1 :
	lb.	lb.	lb.	lb.	lb.	
13th September, 1929	14·5	51	1	8·5	1·94	4·3
28th September, 1929	17·75	63·75	1·25	8·5	2·35	4·3
12th October, 1929 ...	21·25	76·75	1·5	8·5	2·79	4·2
14th October, 1929 ...	21·25	76·75	1·5	8·5	2·72	4·0
2nd November, 1929	29	102	2	8·5	3·65	4·1
14th November, 1929	32·5	114·75	2·25	8·5	4·09	4·1
28th November, 1929	36	127·5	2·5	8·5	4·52	4·1
12th December, 1929	39·5	140·25	2·75	8·5	4·95	4·1
19th December, 1929	43	153	3	8·5	5·38	4·0
26th December, 1929	46·5	165·75	3·25	8·5	5·82	4·0
9th January, 1930 ...	50	178·5	3·5	8·5	6·25	4·0

RATIONS Fed.—Lot III.

Date.		Maize	Separated Milk	Meat Meal	Bran	Pollard	Green Feed	Total Digestible Nutrients	Nutritive Ratio, 1:
		lb.	lb.	lb	lb	lb	lb	lb	
13th Sept.,	1929	8·25	33	0·75	2·75	2·75	8·5	1·57	4·1
28th Sept.,	1929	11	44	1	3·5	3·5	8·5	2·03	4·1
12th Oct.,	1929	13·75	55	1·25	4·5	4·5	8·5	2·51	4·2
14th Oct.,	1929	13·75	55	1·25	4·5	4·5	8·5	2·45	4·0
2nd Nov.,	1929	19·25	77	1·5	6·25	6·25	8·5	3·37	4·0
14th Nov.,	1929	22	88	1·75	7·25	7·25	8·5	3·85	4·1
28th Nov.,	1929	24·75	99	2	8·25	8·25	8·5	4·33	4·1
12th Dec.,	1929	27·5	110	2·25	9·25	9·25	8·5	4·75	4·1
19th Dec.,	1929	30·25	121	2·5	10·25	10·25	8·5	5·30	4·2
2nd Jan.,	1930	33	132	2·75	11·25	11·25	8·5	5·78	4·2
9th Jan.,	1930	35·75	143	3	12·25	12·25	8·5	6·27	4·2

The faeces in Lot III contained a percentage of husk which gave the impression that a considerable amount of bran was not being assimilated. Broken maize was found in the faeces of all lots, but as the experiment proceeded the amount became less, though it did not completely disappear.

Lot 1.

The consumption of coal cinders was of interest, Lot II showing greater preference than Lot I, while Lot III apparently had little or no desire for them. This preference was uniform throughout the test.

During the first week Lot III showed a distinct preference for swill feed, but this diminished during the second week when the pigs spent their time evenly between the two troughs. At the beginning of the experiment all lots were leaving a small percentage of broken grain and husk in and around the troughs, Lot III leaving more than the other two, but by the end of the first week all grain was being ingested.

The pigs in Lot I left 14 lb. of maize on the 23rd December, 1929, then cleaned up their ration each day till the 28th December, when they left 26 lb. of maize. On 29th December they again left 23 lb. of maize, after which they cleaned up the ration each day to the completion of the experiment. It is thought this was due to the heavy ration which they were receiving

During the hot weather preference was shown by all pigs for the milk and swill feed. It was noted that the pigs in Lot II were showing a dislike for the meat meal, some of it being allowed to remain in the trough and become encrusted to the sides. Mixing the meat meal with the maize, which was done from 8th November, rendered it more appetising and consumption was accordingly increased from that time.

Lot II.

The Health Aspect.

The health of the pigs was normal except for temporary lameness of no moment, of one Tamworth sow in Lot I, and for suppurative otitis in two crossbred pigs (one barrow and one sow) in the same lot. The pigs were kept under close observation and it was found that the appetite was not affected, the condition lasting only a few days. One Berkshire sow in Lot II appeared to have no desire for her food during the week 22nd-27th November, 1929, and during that time lost 2 lb., apparently because of digestive derangement. One pig in Lot III acquired suppurative otitis on

16th October, 1929, and owing to bullying and possible infection was segregated. It did not go off its feed, and quickly showed signs of improvement, putting on weight evenly with the others, but its head remained permanently lower on the affected side. It was not returned to the yard.

The Increases in Weight.

The following table shows the average weights of each lot at weekly intervals and the average increases:—

WEEKLY Weights and Differences.

Week-ending.	Lot I.		Lot II		Lot III	
	Average Weight.	Average Gain.	Average Weight	Average Gain	Average Weight	Average Gain.
	lb.	lb.	lb.	lb.	lb.	lb.
11th September, 1929 ..	48·54	......	40·18	......	32	.....
18th September, 1929 ...	52·63	4·09	44·36	4·18	36·72	4·72
25th September, 1929 . .	58·0	5·37	47·9	3·54	41·63	4·91
2nd October, 1929 . .	66·09	8·09	54·63	6·73	49·0	7·37
9th October, 1929 ...	70·36	4·27	59·09	4·46	54·36	5·36
16th October, 1929 ...	77·27	6·91	64·09	5·0	59·9	5·54
23rd October, 1929 ...	86·0	8·73	71·27	7·18	67·81	7·91
30th October, 1929 ...	92·54	6·54	77·0	5·73	74·0	6·19
6th November, 1929 ...	99·54	7·00	84·72	7·72	83·18	9·18
13th November, 1929 ...	108·17	8·63	92·36	7·63	89·54	6·36
20th November, 1929 ...	117·0	8·81	102·0	9·63	100·27	10·72
27th November, 1929 ...	126·18	9·18	111·9	9·9	108·81	8·54
4th December, 1929 ...	136·09	9·9	118·9	7·00	121·09	12·27
11th December, 1929 ...	147·45	11·36	126·72	7·81	126·54	5·45
18th December, 1929 ...	157·54	10·09	136·27	9·54	139·45	12·9
25th December, 1929 ...	165·26	7·72	146·63	10·36	145·63	6·17
1st January, 1930 ...	171·54	6·28	155·27	8·64	155·45	9·82
8th January, 1930 ...	178·0	6·45	167·54	12·27	165·63	10·18
15th January, 1930 ...	......	......	174·54	7·0	177·9	12·27
Total Average Gain ...	......	129·46	......	134·36	......	145·9

The Effect on Type.

Differentiation in type, since most of the pigs in the three lots were closely related, was not marked at the commencement of the experiment; the lots were selected roughly on weight.

The appearance of the pigs at the conclusion varied, Lots I and II being of good length and depth, especially the Tamworths and crossbreds, both of which conformed closely to the requirements of the bacon market, while the pigs in Lot III were much fatter and approximated porker conformation.

It is thought the rations were mainly responsible for the differentiation in type so marked when the pigs were marketed.

The Market Report.

The following extracts are from the report submitted by Barnes Bacon Co Ltd, to whom the pigs were sold —

Lot I—The best line of pork heavier and showed considerably less loss in weight in curing that Lots II and III, and there was less fat to lean than in the other lots

Lot II—Second to I lighter in weight but relatively fatter, the pork being slightly softer

Lot III—Not a suitable type, being short and fat, and less heavy than Lot II, with a still greater percentage loss during trimming and curing

Lot III.

The texture of the actual pork in all lots was excellent, but the bones were soft (in our opinion mineral deficiency) After curing, the pork was found to be not at all suitable for the bacon trade, being soft This necessitated extra drying time to make it firm up The pork appeared to be in excellent condition and very suitable for the trade, yet when cured was deficient in flavour, and firmness of flesh

Costings.

The costs of the food consumed were based on the following market rates obtaining at the commencement of the experiment —Maize, £9 13s 4d per ton or 1.04d per lb., pollard, £8 5s. per ton or 0.99d. per lb.; bran, £8 5s. per ton or 0 99d per lb , meat meal, £16 13s 4d or 2 0d. per lb ; separated milk, 2.0d per gallon, green feed, £1 per ton

The following tables show the total cost of each ration, the cost per lb. of gain in live-weight, the value realised, and the profit per lb. gain:—

Lot I.

	£	s.	d.
Maize—381·54 lb. consumed, valued at	1	13	0·8
Separated milk—1,416·93 lb. consumed, valued at	1	3	7·38
Green feed—90·795 lb. consumed, valued at	0	0	9·68
Total cost of ration	£2	17	5·86

The total average gain in live weight was 129·46 lb., which thus cost 5·33 pence per lb. gain.

	£	s.	d.
The price realised at market 13th January, 1930, was	4	5	0·36
The average value of the pigs on 16th October, 1929, was ...	0	15	0
The value of the gain (market value less value of pig at 16th October, 1929) was	3	10	0·36

As the gain made was 129·46 lb., the value realised per lb. gain was 6.49 pence.
The profit per lb. gain was thus 1·16 pence, or 9s. 8d. per 100 lb. gain.

Lot II.

	£	s.	d.
Maize -342·886 lb. consumed, valued at	1	9	8·6
Separated milk 1,219·84 lb. consumed, valued at	1	0	3·96
Meat meal--23·9 lb. consumed, valued at	0	3	11·8
Green feed—96·2 lb. consumed, valued at...	0	0	10·3
Total cost of ration	2	14	10·66

The total average gain in live weight was 134·36 lb., which thus cost 4·9 pence per lb. gain.

	£	s.	d.
The price realised at market 20th January, 1930, was	3	17	7·54
The average value of pigs on 16th October, 1929, was	0	15	0
The value of gain was	3	2	7·54

As the gain made was 134·36 lb., the value realised per lb. was 5·59 pence.
The profit per lb. gain was thus 0·69 pence or 5s. 9d. per 100 lb. gain.

Lot III.

	£	s.	d.
Maize—230·125 lb. consumed, valued at	0	19	11·33
Bran—76·67 lb. consumed, valued at	0	6	3·9
Pollard—76·67 lb. consumed, valued at	0	6	3·9
Meat meal— 19·22 lb. consumed, valued at	0	3	2·44
Separated milk— 920·5 lb. consumed, valued at	0	15	4·1
Green feed—96·2 lb. consumed, valued at...	0	0	10 3
Total cost of ration	£2	11	11 97

The total average gain in live weight was 145·9 lb. which thus cost 4·27 pence per lb. gain.

	£	s.	d.
The price realised at market 20th January, 1930, was	3	17	7·54
The average value of pigs on 16th October, 1929, was	0	15	0
The value of the gain was	3	2	7·54

As the gain made was 145·9 lb., the value realised per lb. gain was 5·15 pence.
The profit per lb. gain was thus 0·88 pence or 7s. 4d. per 100 lb. gain.

Observations.

The range of weights in each lot was small, no pigs differing much from the average.

In Lot III there was a gradual divergence in type from Lots I and II, the former assuming pork conformation while the latter developed into typical bacon pigs. Since all pigs were closely related and of the same type at the commencement of the experiment, the assumption is that the divergence in type was due to the rations fed.

The cost of feeding the pigs under the experimental conditions was very high, and the report from Messrs. Barnes & Co. indicated that the pigs were overfed, yet a substantial profit was obtained. Lots I, II and III giving respectively 9s. 8d., 5s. 9d. and 7s. 4d. profit per 100 lb. gain. No doubt a progressive widening of the nutritive ratio with increasing weights would have resulted in a better product at a cheaper cost.

Messrs. Barnes & Co. stated that the bone was soft and in their opinion due to mineral deficiency. It was observed that Lot II digested more coal cinders than Lot I and that Lot III had apparently no desire for cinders. In the absence of an analysis of the ash of the meat meal, we are unable to offer any adequate reason for the variability in the desire for cinders.

THE INFLUENCE OF FEEDING.

SOME members of grade-recording units, and even members of the pure breeds recording scheme, are apt to think that testing their cows and recording their yields are sufficient in themselves to build up a high producing herd, writes Mr. L. T. MacInnes, Director of Dairying, in his recently issued booklet, *Testing Milk and Cream and Recording Yields of Dairy Cows for Herd Improvement.* Obviously, continues the writer, if the cow is to do justice to herself and her lineage as a producer, she must be fed rationally; that is, given sufficient food regularly and of a kind that will provide fully for her physical requirements (nourishment and heat) and, in addition, enable her to produce milk of a satisfactory fat content in accordance with her normal capacity

The booklet mentioned above can be obtained from the Department of Agriculture, Box 36A, G.P.O., Sydney; price 1s 2d. posted.

KEEP IN TOUCH WITH MARKET PRICES.

OFFICIAL quotations of wholesale market prices based on reliable and independent sources of supply are made available by the State Marketing Bureau of the Department of Agriculture to the two Sydney broadcasting stations, 2FC and 2BL, and the information is also forwarded to a number of country newspapers by mail and telegram and to various organisations of producers. This information is usually broadcasted daily by both the stations mentioned. Those who have not sets to enable them to "listen in" should suggest to their local newspaper proprietors that application be made to the State Marketing Bureau, Box 36A, G.P.O., Sydney, for supply of the information, if not already being received. Newspapers are supplied on either a "collect telegram" basis or by post.

Orchard Green Manure Crops.

TRIALS AT SHIPLEY ON THE BLUE MOUNTAINS.

C. G. SAVAGE, R.D.A., Director of Fruit Culture.

THE soils in the Shipley district are of a light sandy nature, lacking in organic matter and deficient in lime, and fruit trees growing in the locality make but very little growth after a few years. To ascertain a remedy for this defect green manurial trials were commenced in 1929, and a brief account of the results are given in this article.

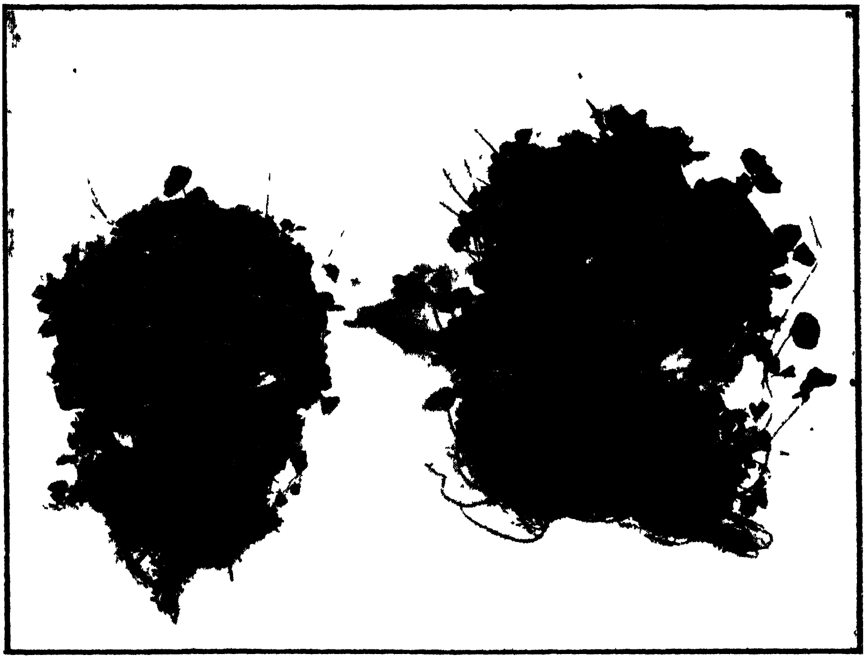

Fig. 1.—Subterranean Clover.
Left: Grown on superphosphate-treated land—height 2 in.
Right. Grown on limed land—height 4 in.

The trials were divided into two sections, one receiving 2 cwt. superphosphate per acre and the other 1 ton lime per acre just prior to sowing the seed of the various crops. The following plants have been under test since 1929, the rate of seeding being shown in parentheses:—Subterranean clover (10 lb. per acre), Japanese millet (10 lb. per acre), Grey field peas (120 lb. per acre), Blue lupins (20 lb. per acre), rye and rape combined (45 lb. and 4 lb., respectively, per acre), barley and rape combined (45 lb. and 4 lb., respectively, per acre), and Golden vetches (15 lb. per acre). The seed in every case was sown in February of each year, viz., 1929 and 1930.

Results in 1929.

In every instance the germination of the seed was good, but subsequent growth on all plots was disappointing. The following observations were made regarding the crops under test during 1929 —

Cereal Crops.—These were more or less yellow in colour and the tender tips of the plants frequently burnt off

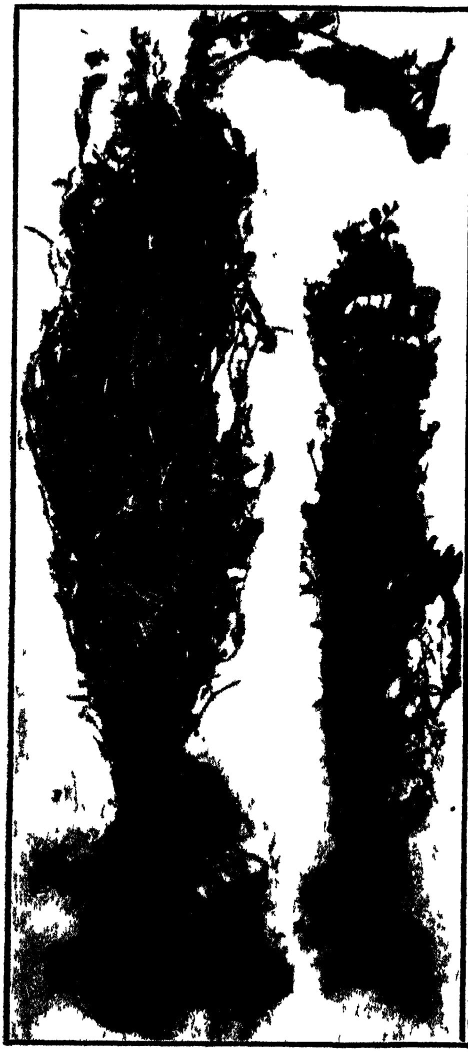

Fig. 2.—Grey Field Peas.

Left. Grown on limed plot—height 3 ft 2 in.
Right: Grown on superphosphate-treatedplot—height 2 ft 4 in

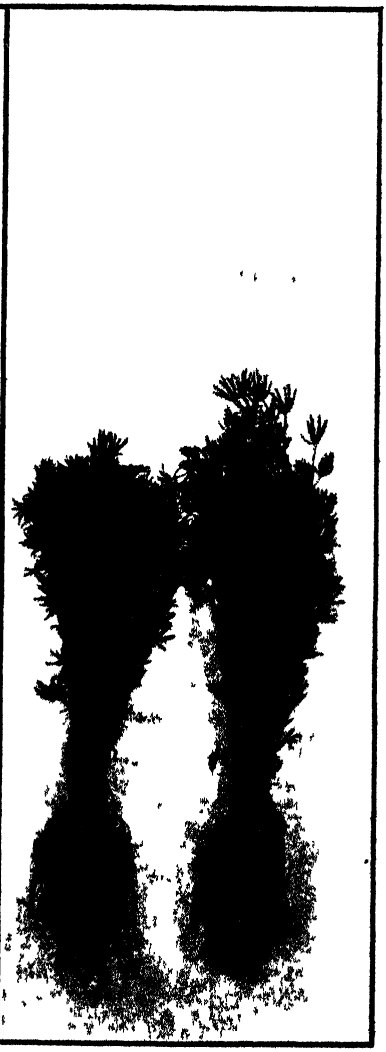

Fig. 3.—Blue Lupins.

Left: Grown on superphosphate-treated plot—height 1 ft 4 in
Right Grown on limed plot—height 1 ft 4 in

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Rape.—Made very poor growth.

Japanese Millet. Although somewhat yellow in colour it did not burn off.

Subterranean Clover.—This crop germinated well, but was slow growing and did not produce sufficient trash by July to justify its use as a green manure crop.

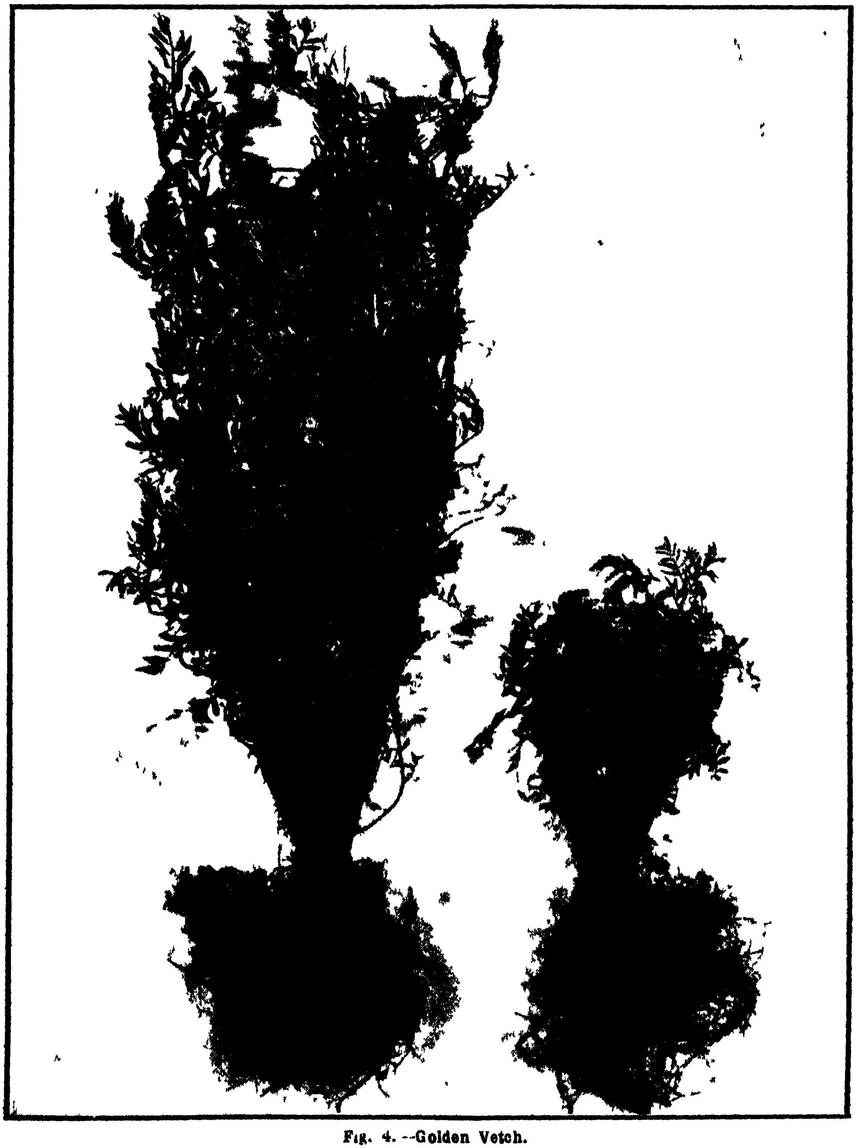

Fig. 4.—Golden Vetch.

Left: Grown on limed soil—height 2 ft 3in

Right: Grown on superphosphate-treated land—height 10 in

Field Peas.—Somewhat yellow in colour and did not make satisfactory growth.

Blue Lupins.—These did not germinate well and the mat of growth was poor.

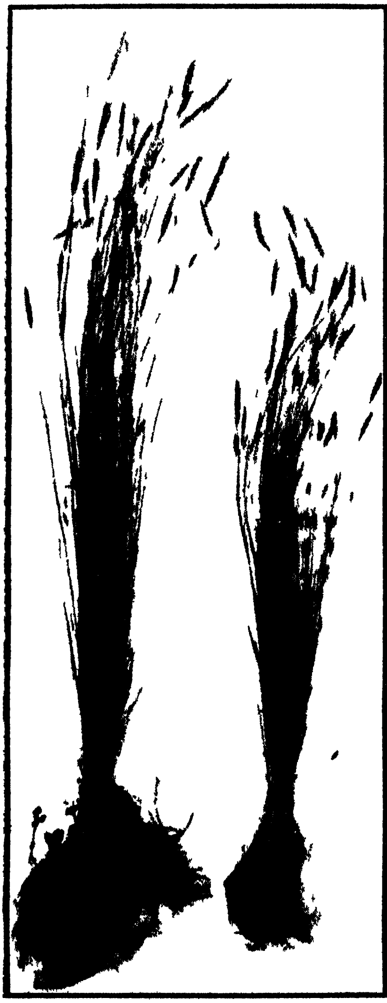

Fig. 5.—Rye.

Left Grown on limed land—height 3 ft.
Right Grown on superphosphate-treated land height 2 ft 4 in

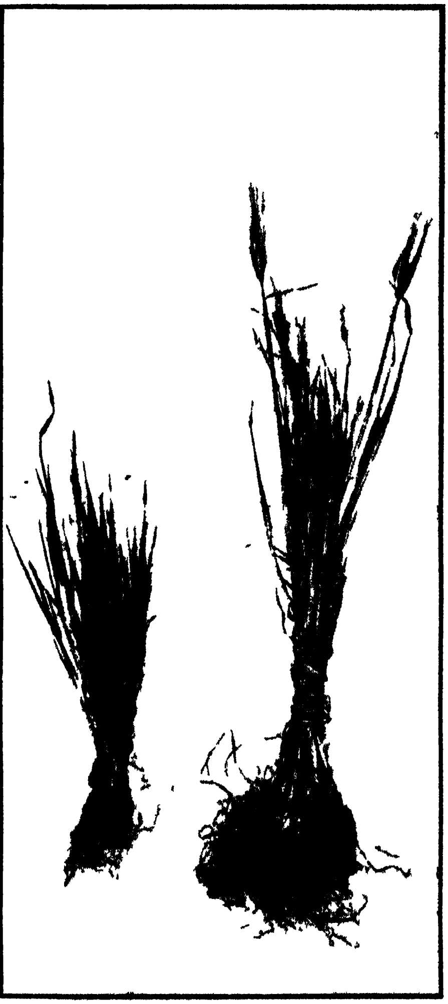

Fig. 6.—Barley.

Left. Grown on superphosphate-treated land—height 8 in
Right· Grown on limed land—height 1 ft 4 in.

Results in 1930.

The results during the past autumn were most marked when compared with those of the previous year, especially on the plots which received lime.

The following table shows the average heights of the different green manure crops in each of the plots in July, 1930, during which month they were ploughed under:—

Crop	Soil limed at rate of 1 ton per acre during 1929 and 1930		Superphosphate applied at the rate of 2 cwt. per acre in 1929 and 1930	
	ft.	in.	ft.	in.
Grey Field Peas	3	2	2	4
Blue Lupins	1	4	1	4
Golden Vetch	2	3	0	10
Rye and Rape	3	0	2	4
Barley and Rape ...	1	4	0	8
Subterranean Clover	0	4	0	2

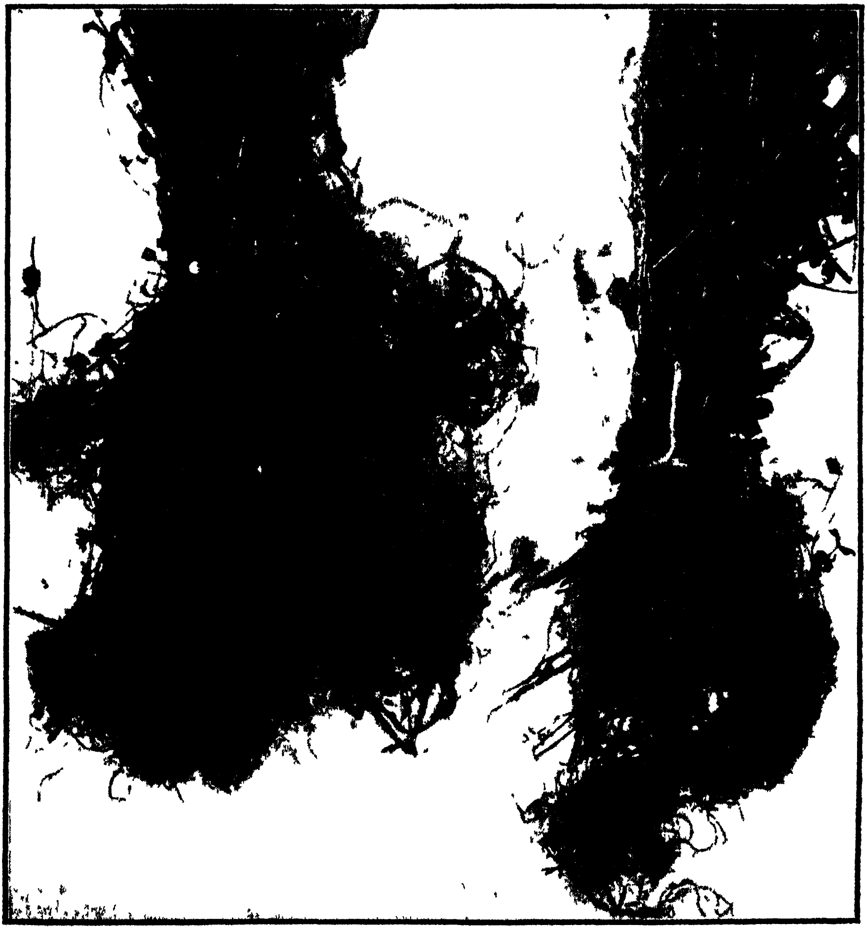

Fig. 7.—Showing Root Nodule Development on Roots of Grey Field Peas.
Left: Grown on limed land.
Right: Grown on superphosphate-treated land.

Conclusion.

These results tend to show that for best results on light, sandy, acid soils, such as found on the Blue Mountains, lime should be applied to the soil prior to planting the green manure crop. This does not mean that superphosphate—the other fertiliser used in the trial—was of no use; in all probability lime and superphosphate in combination may prove even more beneficial than lime alone. It is intended to carry out further trials in the near future to test this point.

Grey field peas and Golden Vetch produced the greatest amount of trash for ploughing under, and, moreover, being legumes they possess a further advantage over the cereal crops in that, by the agency of the bacteria living upon their roots, they have the power of gathering nitrogen from the air. A much greater development of root nodules formed by the nitrogen gathering bacteria was noticeable on the legumes in the limed than in the superphosphate treated plots (see Fig. 7)

ARTIFICIAL WATERING OF GARDENS.

ARTIFICIAL watering may prove injurious if not properly done. The United States Department of Agriculture says frequent light sprinklings of the garden are harmful. The proper method is to soak the soil thoroughly about once each week, preferably during the evening, and then loosen the surface by cultivation as soon as the soil is dry enough to work. No more water should be applied until absolutely necessary; then another soaking should be given. On a small scale water may be applied with a sprinkling can or a garden hose. Perhaps the best method is to open slight furrows alongside the rows of plants and allow the water to flow gently along the furrows. After the water has all soaked into the soil the wet earth in the furrows should be covered with dry soil to prevent baking.

A NEW SCIENCE FOR AN OLD ART.

THE art of agriculture is as old as civilised man. . . . Through the ages the man of the soil has followed in the footsteps of his ancestors, and has learned in the hard school of experience. His task was laid out for him, and he spent little time in puzzling about underlying principles. Farming was an art until a time so recent as to be within the memory of men now living. To day, however, we live in an era marked by widespread use of the findings of science to make available the material things man craves. Organised scientific knowledge has replaced tradition. The farmer is no longer at the mercy of capricious nature because, now that he comprehends her laws, he can mould and direct to his own ends the elements and forces of the earth. Farming, like all industry, has become scientific.

MORE attention must be given to the proving and selecting of herd sires if the greatest progress in milk production is to be made.

The Grape-fruit.

BETTER VARIETIES WILL MEAN INCREASED CONSUMPTION.

R. J. BENTON, Special Fruit Instructor.

THE grape-fruit (*Citrus paradisi*), so-called from the fact that it is borne in large clusters, is also known as the pomelo, a name mistakenly applied to the shaddock. The latter, however, belongs to another species, namely, *Citrus maxima* or *grandis*.

This variety of citrus fruit is becoming increasingly popular all over the world as a breakfast table appetiser, and in America its consumption has been largely increased by means of propaganda. Locally, too, sales have latterly been increased, but not in a great degree, and so far as the variety at present grown (Marsh) is concerned it would seem that it is not likely to advance much further. Consumers in New South Wales apparently eat grape-fruit because they believe it to be beneficial to the digestive system rather than because they like it, and unless a variety which combines greater palatability with wholesomeness can be offered to our public it appears that the consumption rate must necessarily be restricted.

Only a small area of pomelos (approximately 200 acres) is cultivated in New South Wales, and practically all of the fruit is of the Marsh variety. Much of the product, however, is difficult to dispose of, particularly during midwinter and early spring, at which season (June to September) the bulk of the fruit matures. An occasional grower is very successful with Marsh. The fruit is not of higher quality, but the treatment given to it during harvesting and before marketing warrants and results in a much above average price.

Such growers firstly clip all fruit carefully, then grade it for quality, the coarse, rough-skinned being separated from the smoother, pale-coloured specimens. All such graded fruit may then be stored in lug boxes stacked in a ventilated shed, away from the wind or draught. The fruit will often thus keep in good condition for two months, sometimes longer, according mainly to the season. It is washed with soapy water and well dried prior to marketing, and occasionally is given the merest wiping with a paraffin or vaseline rag to add to its sheen. Without a plant to reduce labour to the minimum only a small quantity of fruit can be so handled. Such curing as the storage makes possible results in an increased juice content with a thinner rind. Every care in handling the fruit is necessary, for like all citrus fruits any injury is an invitation to rapid decay.

Harvesting during periods of dry weather is advisable, and where morning dews are heavy no doubt picking late in the day would help to minimise mould development.

Cultivation of the pomelo is very similar to that of the orange tree. Usually budded on common lemon stock, the tree on planting out is of vigorous growth. It is about as hardy as the orange, and less liable to frost injury than the lemon. Annual ploughing and cultivation, together with fertilising, appear to be as necessary for grape-fruit as for orange culture. The bright yellow colour of the rind renders it very important to keep insect pests strictly under control. Particularly should fruit-fly infection be minimised as much as possible, their "stings" being readily recognisable.

With respect to the relative importance of grape-fruit culture in other citrus-growing countries, it is interesting to note that of 350,000 boxes of all citrus fruit produced in Jamaica, 150,000 boxes (42 per cent.) are of grape-fruit.

In Florida of the oranges and pomelos produced the latter comprise about 30 per cent.

In California of the oranges and pomelos produced the latter comprise about 3 per cent.

In New South Wales of the oranges and pomelos produced the latter comprise less than 1 per cent.

It is in the United States that the pomelo is apppreciated to the greatest extent. In that market fruit from Florida and the West Indies is regarded as being superior to anything produced and realises the highest prices, 1½ dollars or more per case frequently being received over that from other sources. Varieties in Florida and the West Indies are not limited to Marsh. In California, however, as in New South Wales, the fact that the Marsh variety is seedless has apparently been allowed to outweigh more desirable characteristics, such as a thinner rind and less bitterness, or a better combination of sugars and acids. Hume states that the favourite varieties in Cuba are Duncan, Marsh and Walters. Many of the favourite Florida varieties were originally seedlings, the flavour of which was regarded as being better than that of Marsh, which is of Florida origin. Marsh has frequently been imported to this State, permitting an opportunity of comparing its quality as grown in Californian locations and in New South Wales. Much of the Californian fruit is not of better quality than that produced here, but it was noted that Imperial Valley (California) produced fruit of superior character. Arizona-produced Marsh is also a finer quality fruit, indicating that soil and climate play their part in this respect. There is no doubt, however, that our strain is identical with that imported.

It is interesting to note Hume's remarks in regard to a comparison of Florida and Californian grape-fruit quality. He states: "At present it seems probable that Florida will retain control of the pomelo market for some time, probably indefinitely. . . . The Californian grape-fruit has not, up to this time, met with the same favour in the markets, though it is possible that varieties may yet be brought forward better suited to the soil and climate of that State." Professor E. J. Coit (California) states: "Whilst seedlessness is a very desirable character in a fruit, it should not be allowed to outweigh such characters as flavour, juiciness, and quality.

California is in need of a variety of pomelo better suited to the conditions than any now available." These expressions appear to be very applicable to grape-fruit production in New South Wales.

The main objection to Marsh in this State is the tendency to an unduly thick rind and a too pronounced bitterness of flavour. The sugar, acid, and bitterness are not well combined. With young vigorous trees such defects may be expected, but many trees over ten years old do not reveal the refining influence which might be expected in this direction. Marsh is usually called Marsh's Seedless, but the reference to seedlessness is somewhat misleading, for usually from two to six seeds are present. It is commonly thought in this State that unless a pomelo is seedless or almost so, it cannot be classified as a grape-fruit. As a matter of fact there are many varieties of grape-fruit, all of which produce seeds, Marsh alone being almost seedless.

In view of the fact that though Marsh is a popular variety in Florida and Cuba, a high quality is produced only in Arizona and Imperial Valley in California, it appears advisable to extend very gradually with the variety in this State pending the results of tests with other sorts. Some of the latter which have been successfully introduced by the Department are Duncan, Thompson, Imperial, and a variety from Hong Kong.

With the exception of that grown in Imperial Valley (and unusual climatic conditions prevail there) practically the whole of the high quality grape-fruit is produced between north latitude 15 to 30, and in proximity to the ocean's influence. China and the East Indies, as well as Florida and the West Indies, are in such situations, which facts are probably of material significance.

IS CHANGE OF SEED WHEAT NECESSARY?

IT is often contended that continuously growing seed wheat on the one farm leads to deterioration, and that it is frequently necessary to change the seed. Listen to what Professor G. W. Shaw, of the University of California, has to say on the subject:—"Loss always occurs by mere change of seed, except only when there is a better type of wheat or more vigorous grain of the same type."

FACTORS WHICH DETERMINE FERTILITY.

THERE are many factors which influence soil fertility, but the soil which provides the best conditions for plant growth is the one in which there is a sufficiency of water, air and plant-food, and in which the conditions regarding temperature are correct. The plant must have adequate room for root development, and there must be an absence of toxic substances. Any one of these may be a limiting factor as regards fertility.

Orchard Notes.

JANUARY.

C. G. SAVAGE and W. LE GAY BRERETON.

Cultivation.

EXCEPT where it is intended to sow a green crop early this month for ploughing under, the orchard should be kept clear of weeds and a good dry soil mulch maintained. For a description of the best methods of carrying out these operations readers are referred back to these Notes of recent months.

Green Manure Crops.

Though it is important to increase the humus content of most of our orchard soils, green manure crops should only be used for this purpose in districts where the rainfall is ample for both the green crops and the fruit trees, or where water for irrigation is available. In other districts green manuring is a hazardous practice.

Before sowing the crop the land should be lightly ploughed, or, if a drill cannot be used for sowing, large seeds such as peas or tick beans could be lightly ploughed in. Superphosphate or a mixture of equal quantities of superphosphate and blood and bone should be sown at the rate of about 1 cwt. per acre along with the seed.

A leaflet on green manure crops for the orchard is available on application to the Department of Agriculture, Box 36A, G.P.O., Sydney.

Re-soiling Citrus Orchards.

As the citrus harvest is practically completed it is a good time, if the land is not too wet, to get ahead with the work of re-soiling.

Harvesting.

Though coastal stone fruits have been harvested there still remains much of this fruit to be picked in the inland parts and tablelands, where later varieties are grown, and, moreover, as the marketing of the apples and pears in these latter districts has only just commenced, it is opportune to draw attention to the fact that leaflets are available on picking, packing and marketing apples, pears and peaches. Information on the subject of drying of fruit is also available in bulletin form ("Fruit-Drying," price 11d., posted),

Pests.

Citrus Scale.—A watch should be kept for the young white wax scales hatching out. Spray them with washing soda (1½ lb. crystals to 4 gallons of water) before they develop their protective covering of wax to any extent.

A watch should also be kept for red scale, the young of which generally emerge later than the white wax scale. The red scale should either be sprayed with one of the approved light miscible oils or fumigated.

Leaflets on white wax, red and brown olive scales, and on fumigation are obtainable from the Department.

Codling Moth.—Though this pest first appears much earlier, it is towards the end of December or early January before it is possible to say whether it has been successfully checked in the early period or not. In any case the grower must not let up in his fight against codling moth. Growers should write for a copy of the recently-published leaflet dealing with this pest.

Woolly Aphis.—In most localities the parasite *Aphelinus mali* can be trusted to keep this pest in check.

Marketing Bananas.

From advice received from Mr. H. W. Eastwood, Fruit Instructor, Byron Bay, the production of bananas on the North Coast is showing a marked upward tendency. The number of cases marketed in July last was 5,587, in August, 8,282 cases, September 10,048 cases, and October, 13,199 cases.

With production assured, growers are urged to pay greater attention to the marketing side of the industry, as competition for good prices, particularly in view of the present limited purchasing power of the consumer, will be keener than ever. A tendency towards better grading and packing of bananas is already apparent, but Mr. Eastwood claims that there is still room for much improvement.

Honest grading is the basis of good packing, and growers who have quality fruit and who grade strictly and pack properly are rewarded by quick sales and top prices. Attention to these matters soon builds up a reputation and consequently a demand for a certain grower's fruit. Bananas of the same quality often command greatly varying prices, simply because one grower pays more attention to the get-up of his product than does the other.

Hints on Banana Packing.

Tight packing is necessary regardless of the system of packing employed. The fruit should be firm against the sides and ends of the case, and the centre should be closely packed to keep the rows in position. Slack packing results in damaging of the bananas and consequently poor returns.

In the past many styles of packs—full hands, half hands, part hands and singles—have been tested, but at present packing in singles has superseded all other methods. While agreeing that the single pack, mainly because it is the accepted practice, commands more attention from buyers at present, Mr. Eastwood claims that the single pack has not as many points to recommend it as some of the other methods.

Part-hand packing—part hands comprise two to eight bananas, usually an even number—is considered preferable to packing in singles, as the packing takes less time, there is less handling of the fruit, and there is not so much tendency for the bananas in part hands to wilt. If the fruit is uniform in size, with a good curve, and provided the fingers are close to one another, part hands will pack neatly and tightly in the case.

Packing in half hands, although quicker than single and part-hand packing, can only be employed with bananas that are well filled and of the required curve. Bananas are not easily packed in full hands, and loose packing is more general with this system than with any other.

Marketing on the Bunch.

If bananas could be marketed on the bunch a considerable saving in time, labour and money would be effected. In most countries outside Australia marketing in bunches is customary. The United States of America's requirements are imported in bunches from Central and South America, Cuba, Jamaica, and Hawaii, while the United Kingdom and European countries import bananas in bunches from the West Indies, the Canary Islands and Trinidad. In some instances the bunches are wrapped singly and packed in straw in crates, and they carry in excellent condition.

As with most new methods, certain difficulties would have to be overcome if it was decided to adopt this method; but these should not prove insurmountable. The question, however, as to whether it is to the advantage of the industry in this State to market in cases or on the bunch will have to be left for growers to decide.

RESTRICTIONS ON THE IMPORTATION OF FOWLS.

THE Chief Veterinary Surgeon of the Department of Agriculture, Mr. Max Henry, advises that owing to an outbreak in Victoria of what is known as "Newcastle disease" in fowls, the introduction of live fowls into this State will only be permitted if accompanied by a license from him. Any person desirous of introducing poultry from other States should apply to the Stock Branch, Department of Agriculture, Box 36A, G.P.O., Sydney, for particulars.

AN ARGUMENT FOR GOOD DAIRY BULLS.

ONLY the exceptional dairy cow adds even three heifers to the herd in her lifetime, while bulls can sire hundreds of daughters. It can be seen, therefore, that it is essential that only good bulls be used if the production of dairy herds is to be increased or even maintained.

WHILE the sire in a herd is of great importance, the heifer calf is the dam of the future, and on its early care and feeding depends greatly the development of its milking and breeding qualities. The under-developed calf, as a rule, makes a poor producer and mother.

Poultry Notes.

JANUARY.

E. HADLINGTON, Poultry Expert.

Treatment of Birds During Heat Waves.

HEAT WAVES are experienced practically every summer and when severe cause very heavy losses to poultry farmers who may not be aware of the high temperature or are not present to prevent the losses at the critical time. When the temperature rises above 100 deg. Fahr., poultry require special watching and care to prevent mortality Under oppressive conditions it is essential to make regular visits to the houses to ensure that the birds are not affected by the heat and also to prevent them from packing in the corners and nests in search of a cooler place, but which really only makes matters worse.

Fowls suffering from heat apoplexy show unmistakable symptoms. They do not move when disturbed and they appear prostrated: very heavy breathing and rapid heart action are also noticeable. Such birds should have their heads dipped in cold water or put under a tap, at the same time wetting under the wings. They should then be placed in the coolest spot available, preferably in a draught where the ground has been watered to make it cooler. It is not advisable to saturate the bird with water, as in the event of a sudden cool change (a very common happening after heat waves) it is likely to cause a chill.

Water should not be thrown in the houses, as this practice tends to increase the humidity, especially when there is very little wind. Adequate circulation of air within the house is one of the greatest safeguards, and this ventilation should be provided by allowing an aperture 4 to 6 inches wide along the top of the back wall of the house, and in addition the house should have an open front. Well-ventilated houses are cooler than the shade of trees, and on no account should the flock be shut out of the houses.

When a hot day can be predicted particular care should be taken that a plentiful supply of drinking water is available, but it is a wise plan to reduce the usual amount of mash given, because digestive troubles are likely to follow the drinking of large quantities of water after a heavy feed of mash. In any case the birds are all the better if kept a little hungry during a hot spell. In extreme cases the morning mash can be entirely cut out and cracked maize substituted.

Some Further Overseas Impressions.

While in Lancashire I visited the laying competition and breeding station run by the Lancashire Utility Poultry Society, at New Longton. In this test provision is made for 1,385 birds (entered in groups of ten and five, also as individual entries), all birds being trap-nested. The pens cover 15 acres of land, and are laid out with 15 feet lanes between them so that the houses can be entered without going into the runs. The size of the houses is 13 feet by 9 feet, and each is divided in the centre to make two pens, the runs being 42 feet by 42 feet.

Eleven of the pens are devoted to the pedigree breeding scheme, six are used as breeding pens and five for rearing chickens. The breeding scheme was inaugurated last year with the object of commencing a stud book for breeders who desire to participate and whose birds have put up scores of 200 eggs or over of 2 oz. weight in any of the laying tests recognised by the National Poultry Council. Owing to limited accommodation, only three breeds (White Leghorns, White Wyandottes and Rhode Island Reds) are at present being accepted, and not more than three hens can be entered by any one breeder In the first year, as there were no males available bred from officially tested hens, a selection of males submitted by the breeders who had entered pens under the scheme was made by the committee, but in future it is intended to accept only males bred at the station from tested hens The chickens hatched at the breeding station are web-punched and wing-banded, and a record is kept of all sound chickens hatched. They are reared up to ten or twelve weeks old and then all suitable birds have a sealed numbered wing band put on in place of the original one, and the other wing is tattooed to indicate the year.

A charge of £1 is made for each hen entered and 5s. for each chicken returned to the owner bearing a wing band. The society will register sales of "registered birds" and issue a certificate to the purchaser for a fee of 1s. each. The promoters of the scheme are enthusiastic as to the benefits to be derived, but I must confess that I was not impressed with the quality of the birds at the World's Poultry Congress which were bred under this scheme. Without rigid selection at maturity by the committee the essential factors of physique and quality cannot be ensured.

Egg Trade in Great Britain.

In London I visited the various egg-selling agents in Tooley-street and Leadenhall markets, also the Overseas Co-operative Federation floor, now known as the Empire Dairies Ltd.

I made searching inquiries regarding the grading of our eggs, and without exception all the agents when asked their opinion about the 1¾ oz. minimum eggs in a 15 lb. pack, agreed that this grade was quite satisfactory, and that there was no benefit in sending a pack with a minimum of 1⅞ oz. Yet officials of the High Commissioner's Office who are in touch with the egg trade still held to the view that the 1⅞ oz. minimum should be retained. Just after finishing inquiries among the egg merchants I received a cable from the Under Secretary of the Department asking if I recommended the 1¾ oz. minimum pack, and I was able to reply at once in the affirmative.

At Messrs. Gillanders I inspected some eggs which had been oil processed in America and cold stored for four months before being exported to London, where they were kept for four weeks out of cold store, and they showed air cells only equal to eggs a couple of weeks old. The cases used for these eggs were made with boards close together and were lined with paper-bags made with a layer of bitumen between two sheets, the idea being to prevent evaporation. Subsequently I saw these paper-bags in use in America.

In the course of my inquiries I learned that the National Mark scheme in England was not meeting with the support that was expected, and that only about 10 per cent. of the eggs were being marketed under the scheme, the trouble being that many of the producers were selling direct to consumers to avoid the cost of handling under the National Mark. The position appears to be much the same as that experienced with our voluntary egg pool, and it is very doubtful if any measure of success will be achieved without compulsion. In fact, the question of establishing an egg board on similar lines to that operating here is being considered.

Grading for Local Trade.

For hen eggs produced in England and Wales there are four statutory grades, as follows:—Special, 2¼ oz. minimum weight; standard, 2 oz. minimum weight; medium, 1¾ oz. minimum weight; and pullet, 1½ oz. minimum weight. First quality eggs only are handled, and the air cell must not exceed ¼ inch in depth.

From general inquiries made it was ascertained that there was very little trade done in the special grade, and there was a good demand for the medium grade (1¾ oz. minimum), so that in effect there were only three grades in the main trade. Moreover, it was apparent that by increasing the grade weights the average price had been lowered.

In Northern Ireland there is a Marketing of Eggs Act, under which it is an offence to sell dirty, stained, or stale eggs; it is also compulsory to sell eggs by weight except where they are sold direct to the consumer, in which case they may be sold by the dozen. All wholesale dealers and retail merchants must be licensed, and when eggs are purchased from producers they must be packed in a specified order, beginning from the right hand side of the case, which is marked "1," and filling each row from front to back of the case and working towards the centre. The other side is packed in the opposite way, and the last egg packed must be wrapped in a piece of paper bearing the name and address of the producer, the quantity of eggs, the date when purchased, and the name and address or license number of the purchaser. All eggs must be candled upon delivery in store, and the unpacking for testing is done in the reverse way to the packing. A record of the result of testing must also be kept. The eggs must be packed in non-returnable cases, and the cases marked with the license number of the packer, the grade of eggs, and a code mark indicating the date of packing. Every egg store is subject to close inspection by Government inspectors.

The grading is much the same as in the English regulations, and it is significant that no improvement in prices has been secured since the adoption of the super grades. The methods adopted for ensuring the quality of eggs has, however, had the effect of increasing their sale in England, where they are looked upon as being among the best on the London market.

The Irish Free State.

Similar regulations governing the packing and grading of eggs are in force in the Irish Free State. Exporters of eggs are registered, but unlike those of Northern Ireland, who can send eggs to England without stamping, the Irish Free State exporters have to stamp the eggs on the shell with country of origin, and it is stated that this works out detrimentally to the sale of eggs in England. In order to prevent speculators in England from cold storing Irish Free State eggs in the flush season and selling them later as fresh eggs; a system has been adopted of stamping the eggs in red at one time of the year and in black during the remainder of the year, so that it is known when they were exported.

At one of the leading egg floors in Dublin grading of eggs is done by using a series of three or four trays one over the other with holes in each to correspond with the different grades, so that the small eggs fall through to the lower trays and the largest remain on top. Two series of trays are arranged close together, so that one girl can unpack on to a set of trays and then slide them to another girl who re-packs them. It was admitted that the system was not absolutely accurate, but it was claimed that it was near enough to meet requirements.

The Dressed Poultry Trade.

I was surprised to find that prices for dressed poultry in England were even lower than in Sydney. This, I think, is largely due to the influx of well-graded birds from the Continent, which sell very cheaply. At the Smithfield market I found that Dutch chickens weighing 2 to 2¼ lb. were selling at 1s. per pound, and Russian chickens at 10d. per pound, and even down to 8d. a pound for broken-breasted birds. English ducks weighing 5½ lb. sold at 10d. per pound, while Irish Free State milk-fed chickens of 3 to 3½ lb. weight brought up to 1s. 6d. per pound. The best prime English birds made about the same price.

A large proportion of local dressed poultry coming into the Smithfield market is packed in crates or cane baskets with straw between them. Various sizes of crates are used, but a couple of the most common are 3 feet x 2 feet x 15 inches and 2 feet x 18 inches x 15 inches. An enormous quantity of poultry comes into the Smithfield market annually, amounting to 15,000,000 lb., yet the consumption per head of population is only two birds per annum.

While in Northern Ireland I visited Messrs. Armour's poultry and egg packing plant, where some 500,000 birds are handled per annum, as well as a very large quantity of eggs. The birds and eggs are bought from collectors in the local market, or direct from farmers. Provision is made for fattening about 9,000 birds at a time in batteries constructed with galvanised angle-iron frames, wire rods for the sides, and wire mesh floors.

The birds are fed on semi-solid buttermilk and ground oats mixed to a sloppy consistency. The plucking is done dry and the birds are hung on racks to cool off, afterwards being moved into another room with electric fans to further cool them. A large proportion of the birds are sent across to the London market, being packed in cases of various sizes according to grade.

National Mark Scheme for Dressed Poultry.

Regulations have recently been issued by the Ministry of Agriculture covering the grading and marking of dressed poultry under the National Mark scheme in England and Wales. Prior to issuing these regulations an instructional campaign had been carried out extending over a few years to familiarise those engaged in the industry with packing and grading requirements.

The scheme adopted has been approved by the various sections of the industry represented on the Poultry Advisory Committee of the Ministry of Agriculture, and a Trade Committee which includes producers and distributors has been appointed to advise the National Mark Committee regarding the issue of authorisations to those who desire to come under the scheme. This committee also advises on the general administration of the scheme. The scheme is voluntary, and provided applicants can satisfy the Ministry that they can carry out the specified conditions they may be granted authority to use the National Mark. Inspection work under the scheme is carried out by the Ministry's officials. Only packers who have a certain minimum output of birds, ranging from 720 to 960 per month (according to the period of the year), of which 180 to 240 must be packed under National Mark labels, will be admitted to the scheme. Regulations provide for a minimum of floor space and crating capacity, and also specify as to cleanliness, &c., of the premises of those using the National Mark.

Official labels, discs and seals are sold to authorised packers by the Ministry. Number of birds, grade, weight, &c., and a code mark indicating date of packing must be shown on labels attached to cases of poultry, and a sealed disc showing the grade must be attached to all birds weighing 1 lb. and over. The regulations provide for nine grades of chickens, five grades of fowls, three of ducks, and two grades each of geese and turkeys.

Thus the Ministry of Agriculture in England is attempting to bring about an improvement in the quality of dressed poultry, but it remains to be seen whether the voluntary system will be supported by those engaged in the trade to an extent that will be effective in achieving the desired result.

DAIRY herd yields are dependent firstly on the inherent productive capacity of the cows, secondly on the feeding of those cows, and thirdly on the handling and treatment of the dams and calves.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Bathurst Experiment Farm (Jerseys)	30	1 Dec., 1930
H. A. Corderoy, Wyuna Park, Comboyne (Geurnseys)	54	1 „ 1930
New England Experiment Farm, Glen Innes (Ayrshires)	62	3 „ 1930
Lunacy Department, Morisset Mental Hospital	24	7 Jan., 1931
C. J. Parbery, Allawah, Bega	88	7 „ 1931
Kinross Bros., Minnamurra, Inverell (Geurnseys)	72	11 „ 1931
New England Girls' Grammar School, Armidale	21	16 „ 1931
Lunacy Department, Parramatta Mental Hospital	89	28 „ 1931
W. M. McLean, Five Islands Rd., Unanderra...	73	30 „ 1931
Miss Brennan, Arrankamp, Bowral	10	19 Feb., 1931
Department of Education, Yanco Agricultural High School	33	21 „ 1931
G. A. Parish, Jerseyland, Berry	103	27 „ 1931
Lunacy Department, Kenmore Mental Mospital	76	28 „ 1931
Hawkesbury Agricultural College (Jerseys)	160	1 Mar., 1931
St. Joseph's Girls' Orphanage, Kenmore	10	3 „ 1931
St. Michael's Novitiate, Goulburn	5	3 „ 1931
Kyong School, Moss Vale	8	4 „ 1931
St. Joseph's Convent, Reynold-street, Goulburn	4	4 „ 1931
St. John's Boys Orphanage, Goulburn	7	5 „ 1931
Marion Hill Convent of Mercy, Goulburn	10	6 „ 1931
Cowra Experiment Farm	29	6 „ 1931
Riverina Welfare Farm, Yanco	69	6 „ 1931
Wilkins, James, Jerseyville, Muswellbrook	51	12 „ 1931
Tudor House School, Moss Vale...	8	21 „ 1931
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	202	3 April, 1931
Grafton Experiment Farm (Ayrshires)	180	5 „ 1931
Department of Education, Hurlstone Agricultural High School	45	10 „ 1931
Navua Ltd., Grose Wold, via Richmond (Jerseys)	18	29 „ 1931
Australian Missionary College, Cooranbong	45	30 „ 1931
J. P. McQuillan, Bethungra Hotel, Bethungra	6	1 May, 1931
George Rose, Aylmerton	4	28 „ 1931
William Thompson, Masonic School, Baulkham Hills	48	28 „ 1931
Department of Education, Gosford Farm Homes	30	3 June, 1931
F. C. Kershaw, Macquarie House, Macquarie Fields	71	5 „ 1931
P. Ubrihien, Corridgeree, Bega	114	6 „ 1931
Gladesville Mental Hospital	42	25 „ 1931
A. L. Logue, Thornbro, Muswellbrook	40	28 July, 1931
Webb, A. H., Quarry-road, Ryde	6	26 „ 1931
A. Shaw, Barrington (Milking Shorthorns)	122	9 Aug., 1931
E. P. Perry, Nundorah, Parkville (Geurnseys)	22	13 „ 1931
Wagga Experiment Farm (Jerseys)	55	14 „ 1931
Sacred Heart Convent, Bowral	12	20 „ 1931
St. Patrick's College, Goulburn	8	22 „ 1931
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	46	22 „ 1931
James McCormack, Tumut	111	29 „ 1931
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	81	12 Sept., 1931
J. F. Dowe, "Woolomol," Tamworth	48	19 „ 1931
S. L. Wills, Greendale Dairy, Cowra	37	19 „ 1931
Wolarai College, Orange	10	4 Oct., 1931
Riverstone Meat Co., Riverstone Meat Works, Riverstone	104	11 „ 1931
E. S. Cameron, Big Plain, Narrandera...	28	14 „ 1931
J. L. W. Barton, Wallerawang	17	17 „ 1931
J. F. Chaffey, Glen Innes (Ayrshires)	75	17 „ 1931
Lunacy Department, Callan Park Mental Hospital	29	13 Nov., 1931
J. Davies, Puen Buen, Scone (Jerseys)	85	14 „ 1931
Wollongbar Experiment Farm, Lismore (Guernseys)	129	21 „ 1931
Department of Education, Brush Farm, Eastwood	6	9 Dec., 1931

—MAX HENRY, Chief Veterinary Surgeon.

PROPER management of the cow at calving time means more living calves, fewer sick cows, and better chances for a longer period of greater milk and butter-fat production.

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1st *February*, 1931.

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VOL. XLII. PART 2. FEBRUARY 1, 1931.

Agricultural Gazette of New South Wales.

Championship Field Wheat Competitions.

The Riverina Wheat Area.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

TWELVE district societies in the Riverina division organised field wheat competitions, the winners of which were eligible to compete for the championship competition conducted by the Royal Agricultural Society. However, three societies situated in the southern portion of the division, where a very unfavourable season had been experienced, decided not to submit their winning entries for championship honours.

The societies whose entries were judged were Ardlethan, Ariah Park, Barellan, Barmedman, Griffith, Lockhart, Narrandera, West Wyalong, and Yanco. Judging was commenced at Wyalong on 24th November, and completed at Lockhart on 27th November.

The Season.

The following table shows the total rainfall during the fallow period, and the monthly registrations during the growing period in the various districts:—

RAINFALL Table.

District.	Fallow Period. (June, 1929, to March, 1930).	Growing Period.							
		April.	May.	June.	July.	August.	Sept.	Oct.	Total.
	points.	points.	points.	points.	points.	points.	points.	points.	points.
Wyalong ...	980	89	120	165	131	167	33	404	1,109
Barellan	898	61	72	165	88	207	42	358	993
Griffith	790	34	74	215	80	232	65	407	1,107
Ardlethan ...	914	63	117	156	148	237	60	342	1,123
Barmedman ..	1,104	89	120	165	131	167	33	333	1,038
Narrandera ...	831	58	159	271	94	266	72	379	1,299
Lockhart... ...	742	76	152	152	137	256	68	333	1,174

The rainfall during the fallowing period (June, 1929, to March, 1930) was extremely meagre and consisted chiefly of light showers of little value. The districts in the southern portion of the division suffered most in respect of the sparse rainfall during the fallow period—for instance, a total of only 660 points was registered at Berrigan for the nine months. The winter of 1929 was dry, and difficulty was experienced in ploughing the fallows, which operation in some cases had to be postponed till August. Severe drought conditions ruled during the first three months of this year, only 32 points being recorded for the whole period at Lockhart, and the soil was "bone dry" when the sowing period arrived. As there was no break in the dry conditions until near the end of April, many farmers were obliged to commence sowing on dry seed beds. Steady rain during the last week in April. followed by showers at suitable intervals, were sufficient for germination and for the needs of the young crops, and warm soil and mild weather conditions promoted rapid growth during the winter months. There were, however, no soaking rains of a substantial nature to provide a reserve of moisture in the subsoil to enable the crops to encounter the dry spell which occurred in early spring, and in many instances the increased demands of the heavy growth on the soil moisture could not be met and the crops suffered severely. Copious rains were experienced in October, which served to avert the failure of the crops which appeared imminent, but they were received too late to enable the crops to make a complete recovery. Many crops made second growth which delayed harvesting, and the uneven ripening would probably result in a loss of grain in the case of varieties that are liable to shed, a reduction in quality in consequence of the weathering of the grain in the original crop and pinching of the grain produced by the second growth.

---

* The Riverina championship competition was judged by Mr. Stening.

This is the fourth year in succession that crops in this division have suffered from lack of rain in the early spring, when the crops are heading, which is the most critical stage in the growth of the crop.

The Leading Crops.

The prize-winners were:—

1. O. J. Macauley, "Sherwood," Quandary (Ariah Park Society).
2. W. R. Scilley, "The Bluff," Corobimilla (Narrandera Society).
3. A. H. Gollasch, "Belmont," Milbrulong (Lockhart Society).

Details of the awards and of the cultural methods of each competitor's crop are shown in the accompanying table.

The crop which won the championship consisted of 30 acres of Penny and 20 acres of Yandilla King. The former was very dense and the better yielder of the two, but had already shed grain. The whole crop was heavy and well headed, and estimated to average 36 bushels per acre at time of judging. There was freedom from disease, except a little loose smut, but points were lost for the presence of some strangers and also Cape barley in the crop of Penny, which evidently had been introduced with the seed wheat. A few black oats and some saffron thistle were also present in the Yandilla King portion.

The second prize crop was a heavy, dense crop of Yandilla King, which was assessed to yield 36 bushels per acre of grain of good sample. It was grown on land which had produced five crops previously and was a little tangled and lodged in patches. There were traces of flag smut and foot-rot, and the presence of wild mustard and wild poppies caused a reduction in points for cleanliness.

The crop which won third prize was also of the Yandilla King variety and was dense and well headed. There was a slight infection of take-all and foot-rot, but the crop was free from flag-smut. Black oats and saffron thistles were rather prevalent in the crop and resulted in loss of points.

DETAILS of Awards—The Riverina Wheat District.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops grown Previously.	Rainfall during ‡Effective Period (April to October).	Points awarded.						
									Apparent Yield. (One point for every bushel).	Trueness to Type. (Maximum 20 points).	Freedom from Disease. (Maximum 30 points.)	Evenness. (Maximum 20 points.)	Condition. (Maximum 10 points.)	*Cleanliness (Max. 30 points.)	Total Points.
O. J. Macaulay, Sherwood, Quandary.	Ariah Park	Penny (30 acres), Yandilla King (20 acres).	Ploughed 4 inches deep in June, springtoothed in October and March.	Third week April.	lb. 60	lb. 70	Very old land.	inches ...	36	18	29½	18	9	27	137½
W. R. Scilley, The Bluff, Corobimilla.	Narrandera	Yandilla King ...	Disced 3½ inches deep in June, springtoothed in September, scarified in March.	Last week April.	75	75	6th crop.	12·05	36	18½	28	18	9	26 (29)	135½
A. H. Gollasch, Belmont, Milbrulong.	Lockhart ...	Yandilla King ...	Ploughed 3½ inches deep in August, harrowed in September, and scarified in February.	Second week May.	70	112	7th crop.	12·40	35	18½	28	18	9½	25	134
W. Maclean, "Bamboo Dam," Kamarah.	Ardlethan ...	Nabawa (32 ac.), Yandilla King (18 acres).	Disced 4 inches deep July-August, springtoothed September, October and February.	Second week May.	60	80	Old land.	13·41	32	16½	28½	19	9½	27	132½
F. J. Scott, Bolagamy, West Wyalong.	West Wyalong	Waratah ...	Disced 3 inches deep in July, springtoothed in October and March.	First week April.	60	56	4th crop.	9·62	31	19	28	19	9	26 (27)	132
G. N. Clarke, Cragray, Barmedman.	Barmedman	Penny	Ploughed 3½ inches deep in August, and springtoothed in November.	First week May.	60	65	Very old land.	...	28	17½	28½	18	9	29	130
A. H. Jennings, Trefula, Colinroobie.	Barellan ...	Waratah ...	Ploughed 4 inches deep in June, springtoothed in August, harrowed in September, and scarified in February.	Last week March.	60	80	Old land.	...	29	18	25	18½	9	25	124½
G. C. Pfitzner. Barunga, Goolgowi.	Griffith ...	Waratah ...	Disced August-September 4 to 5 inches, harrowed early October, disc cultivated very shallow before sowing.	May 6th to 8th.	48	48	4th crop.	...	27	15	27	18	9	25 (27)	121
P. J. Evans, Coleslea, Brobenah.	Yanco ...	Bobin	Disced 4 inches deep in July and and springtoothed in March.	Mid-April	60	60	7th crop.	...	25	18	26	15	9	28	121

* First crop, 24 points; second 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points. In parentheses is shown the maximum in each case.

Lessons from the Competition.

Cultural Methods.—The advantage of early fallowing is plainly indicated in the results of this competition, for the champion crop and the one which gained second prize were grown on land which had been fallowed in June; these crops also were the highest yielding crops in the competition. Provided the soil is in a satisfactory condition for ploughing, that is, neither too dry nor too wet, fallowing should commence immediately on the completion of sowing operations in order that full advantage can be taken of the winter months for storing up moisture in the soil.

On account of the lack of rains during the fallow period a limited number of cultivations, including one in the spring and one in the autumn, have sufficed. At the present time of low prices for wheat it is essential to reduce production costs, and consequently the number of cultivations of the fallow should be limited to those which are considered to return an increased yield commensurate with the cost of the cultivation; but on no account should the cultivation of the fallow in the early spring be neglected, for this is regarded as the most important, both as regards the conservation of soil moisture and the preparation of a finely divided and firmly compacted seed bed. It is significant that the only fallow in the competition in the preparation of which the spring cultivation had been dispensed with produced a very patchy uneven crop, although the soil appeared quite uniform.

Varieties.—By figuring in the four leading crops and returning the four highest yields in the competition, Yandilla King has met with signal success. If sown sufficiently early on well-prepared fallow, it is a variety that rarely fails to return high yields. It prefers soils that are inclined to be heavy, while on light soils Penny is proving a very strong rival. These late-maturing varieties had an advantage in that they were not so far advanced when the dry spell occurred in the spring and were able to derive most benefit from the October rains. In spite of being handicapped in this respect, Waratah did well in providing three crops for competition for the championship. The dry springs of the last four years have not been favourable to this variety, still it manages to keep in the running.

Nabawa was represented only as portion of an entry and has not repeated its success in the previous year's competition in this division, when the four competing crops of this variety secured the four leading places in the awards.

This is the first appearance of the new variety Bobin in the championship competitions, and its place in the awards would no doubt have been more satisfactory if better preparation had been given to the fallow. This variety has yielded well in trials on farmers' experiment plots and at Government experiment farms during the past two or three years, and it promises to supersede Waratah as an early maturer. It holds its grain better than Waratah and appears to be less liable to flag smut, but is more susceptible to rust. However, a new variety requires much testing under different seasonal conditions before it can be definitely recommended.

Seeding Operations.—There was a variation in the time of sowing from the last week in March to the second week in May. In recent years the value of sowing reasonably early has been illustrated, but it is considered inadvisable to commence sowing wheat before the 1st of April, especially under dry soil conditions. There were, however, certain factors operating this season that necessitated a start to be made with sowing in March; for instance, in order that as large an area as possible could be sown in response to the appeal made by the Prime Minister, and in many cases, owing to the rapidly diminishing stocks of fodder for the horse teams, it was necessary to proced with the sowings as early as possible. The disadvantage of this very early sowing on a dry seed bed was demonstrated in the crop which was sown in March; not only was there a serious infestation of black oats and wild mustard, but the crop was heavily infected with flag smut and foot-rot.

The rates of seeding ranged from 48 lb. to 75 lb. per acre, with an average of 61½ lb. per acre, and every crop received an application of superphosphate at rates varying from 48 lb. to 112 lb. per acre, the average of which was 71¾ lb. per acre. Although these average quantities of seed and superphosphate may be regarded as quite satisfactory under average conditions in this division, there are several factors that should influence the grower in the determination of the quantity of seed and superphosphate that should be sown, such as the time of sowing and the nature, fertility and condition of the soil.

Diseases.— While there was a slight infection of stem rust in most of the crops inspected, no appreciable damage was sustained, the opportune occurrence of winds and dry cool weather proving an effective check to the development of the fungus. Other diseases were not a serious factor, except in crops which had been sown very early in loose, dry seed beds. These were infected rather seriously in some instances with flag smut, take-all and foot-rot. There is ample evidence that good cultural methods are effective in diminishing the losses occasioned by these diseases, and probably the best means of control is the provision of a well-compacted seed bed, which will ensure a rapid germination and vigorous early growth of the crop.

Northern Wheat Area.

G. C. SPARKS, H.D.A., Manager, New England Experiment Farm, Glen Innes.*

Thirteen districts—the largest number to date—competed in this year's competition, viz., Inverell, Delungra, Bingara, Moree, Narrabri, Wee Waa, Boggabri, Gunnedah, Manilla, Tamworth, Quirindi, Coonabarabran and Binnaway. With the possible exception of Warialda, every agricultural district in the northern division has now a field wheat competition.

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* Mr. Sparks judged this championship competition.

The Northern Championship of 1930 resulted as follows:—

1. S. Carberry, "Cadarga," Culgoora (Narrabri Society).
2. Messrs Osborne & File and W. Skaines, "Elham," Oakwood (Inverell Society).
3. L. G. Pryor, "Erriston," Gunnedah (Gunnedah Society).

Mr. Carberry's winning crop of Ford was on a self-mulching sandy loam —Belar and Wilga country—cropped for the first time. In preparation for this crop the paddock was disced in July-August, 1929, springtoothed early November, harrowed in January, disced late February, harrowed in March and sown 1st April with 41 lb. of seed; unmanured. Sheep were continuously on the fallow and the crop was fed off, 1,500 ewes being put on to 90 acres on 10th May and a further 1,000 early in June, the whole number being left on the crop until the end of June. The growth of the crop was so strong, however, that the heavy stocking hardly checked it. The effective rainfall on the crop was 787 points, but it was lightly flooded in September by a heavy fall of rain over an adjoining scrub area.

The seed came originally from the farmers experiment plots on Mr. Carberry's farm, and showed an exceptional standard of type and purity. The crop was wonderfully well grown and for such a phenomenally heavy crop was standing remarkably well. It was absolutely weed-free and except for a very light rust infection was without disease; apparent yield was 39 bushels per acre.

This is the third consecutive year that Mr. Carberry has won the Narrabri district competition and each year he has shown a greatly improved crop. Observing the possibilities of Ford when first grown on his experiment area a couple of seasons ago, Mr. Carberry selected it specially for this year's competition crop, and developed seed supplies for the purpose. His success pays a tribute to his judgment.

Messrs. Osborne and File and W. Skaines with their fourteen-bag crop of Ford have the honour of producing the highest yielding crop in this year's championship. The soil is a black basalt—box and apple country—cropped to wheat for the second time after being under lucerne for some years. In preparation for this crop the wheat stubble was burnt and the land mouldboard ploughed in late February, harrowed mid-March, scarified mid-April, sown and harrowed 10th May with 58 lb. of seed; unmanured. The crop was fed off between 15th June and 8th July. It did not show the very high standard of type and purity of the winning crop and lost points for disease due to rust infection and a little foot-rot, and for weed growth due to the presence of black oats and variegated thistles. It was, however, tall and well grown, standing well, although a little inclined to lodge in patches, dense and strongly headed and even; a very striking and showy crop produced with a minimum of tillage.

Mr. Pryor's crop of Nabawa was on red to chocolate loam and gave an apparent yield of 36 bushels. It was remarkable in that it was on soil that has produced twenty crops of wheat in twenty years, and in spite of this the weed freedom of the crop was extraordinary—beyond a very light sprinkling

DETAILS of Awards—Northern Wheat Area.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Number of Crops Grown Previously.	Rainfall during Effective Period (April to October).	Points awarded.						
								Apparent Yield. (One point for every bushel).	Trueness to Type. (Maximum 20 points).	Freedom from Disease. (Maximum 30 points.)	Evenness. (Maximum 20 points.)	Condition. (Maximum 10 points.)	*Cleanliness (Max. 30 points.)	Total Points.
S. Carberry, Cadarga, Culgoora.	Narrabri ..	Ford ...	Disc-ploughed July-August, 1929, springtoothed early November, harrowed January, skim ploughed February, harrowed March.	1st April	lb. 41	Nil	787	39	19½	29	19	8½	24	139
Osborne and File and W. Skaines, Elham, Oakwood.	Inverell ...	Ford ...	Mouldboard ploughed end February, harrowed mid-March, scarified mid-April.	10th May	58	1	925	42	18	28	19	8½	22½	138
L. G. Pryor, Erriston, Gunnedah.	Gunnedah ...	Nabawa ..	Disced late January, harrowed March	May (early).	45	Old land.	...	36	18	29	18	8½	28	137½
A. F Collins, Yarrawonga, Boggabri.	Boggabri ...	Nabawa ..	Disced January, scarified March ..	April (early).	39	5	...	36	18½	28½	19	8½	26	136½
Stratton Bros. Redcliffe, Delungra.	Delungra ...	Waratah, Nabawa.	Scarified mid-March	Mid-May	52	Old land.	..	34	17½	28	18	8½	28	134
H. E. Pilditch, Pretoria, Culgoora.	Wee Waa ..	Nabawa	Disced February, scarified mid-April, harrowed (twice) late April.	May (early).	50	Nil	...	34	17½	29	19	8½	24	132
W. E. Tonkin, Myee, Pallamallawa.	Moree ...	Aussie ...	Disced May, 1929, scarified October, springtoothed December, scarified January.	April (mid-late).	48	5	1,249	32	19	27½	18½	7½	27	131½
T. W. Abberfield, Alexander Park, Gunnedah.	Manilla ..	Waratah	Springtoothed early January and harrowed, springtoothed end March and harrowed.	Mid-April	60	2	...	30	18½	28½	18½	9	25½	130
Ernest Jones, Myall Plains, Moylan.	Coonabarabran.	Turvey ...	Portion disced November, residue disced February, harrowed April, springtoothed late April.	10th May	45	Nil	...	34½	19	26	19	7½	24	130
A. Kerr and Cole Bros., Melrose, Duri.	Tamworth ...	Florence	Disced February, harrowed and springtoothed mid-May.	Mid-May	59	Nil		31	18	29	18	9	23	128
T. and D. Scott, Aberfeldie, Currabubula.	Quirindi ..	Gresley ...	Mouldboard ploughed early February, harrowed March, scarified mid-April.	29th April	45	30	1,416	26	18	28	18	9½	28	127½
O. R. and R. A. Gavin, Annaville, Mendooran.	Binnaway ..	Turvey ..	Mouldboard ploughed February, scarified early April.	April (early).	45	Nil	...	34	18	27½	18	6	23	126½
C. Batterham, Orban, Bingara.	Bingara ..	Waratah	Disced January, harrowed March ..	April (late).	48	1	...	30	18	28	18	8	22	124

* First crop, 24 points; second, 25; third, 26, fourth 27, fifth, 28; sixth, 29; over six crops, 30 points.

of the inevitable black oats no weed growth was in evidence—and except for a little rust the crop was disease-free. These facts illustrate the extraordinary fertility and capacity of the soils in the north-west and indicate that the agricultural practice which can achieve such results is sound. In preparation for this crop the land was disced in January-February, harrowed in March and sown in May with 45 lb. seed and harrowed; unmanured. The crop was tall, dense and well headed, slightly lodged in spots, but generally standing well. It lacked the evenness of the winning crop, but equalled it on disease freedom. It was a crop of great merit.

The Season.

The year opened dry, but good rains fell throughout the northern districts at the end of January, ranging from 6 inches at Inverell to 3 inches at Gunnedah, enabling tillage operations to proceed on both long and short fallows. Seeding rains were generally ample to give good germination to early sowings, although later sowings did not come away until after the June rains which were generally copious—Quirindi getting 4¾ inches, Gunnedah 6 inches, Moree 4 inches, &c. Winter temperatures were mild and growth excessive, and the succulent nature of the crops provided conditions favourable to rust attack, which were accentuated by wet and muggy conditions in the spring Fortunately the crops received a check by frost in late winter, which slightly relieved the situation, although some frost damage was noticeable in the crops. Spring rains were variable, the Narrabri crop receiving 65 points in September and 27 in October, but falls at most centres were upwards of 4 inches for the same period, notably 445 points at Pallamallawa and 477 at Quirindi. Under these conditions rust damage was inevitable, and while none of the championship crops was badly rust attacked, some very considerable loss occurred throughout the territory amongst the less favoured.

The Rate of Seeding.

Seven of the thirteen entries were sown in April and the residue during the first half of May. In previous years June seeding was much in evidence, but the tendency now is towards the sounder practice of early seeding with the possibility of winter grazing of the crop. In every case but one, graded seed was used, and in every case seed had been dusted with copper carbonate. Seeding rates varied from 39 lb. at Boggabri to 60 lb. per acre at Manilla, the average being slightly under 50 lb., which can be taken as the approximate seeding rate for the north-west.

No crop was manured, and the position regarding fertilisers seems unchanged in that no increases of yield are given by the use of manures, and their value is the somewhat doubtful one of hastening maturity.

Two only of the thirteen entries were on long fallow, eleven being on the short (summer) fallow, which the climatic conditions of the north-west render possible and profitable. It will be noted also from the accompanying details of the awards that the majority of the short fallowed crops were produced by a minimum of cultivation, which can be taken as an indication of the ease with which heavy crops can be produced on these soils in good seasons and with intelligently directed tillage. At the same time, however, the great fact must not be overlooked that long, well-worked fallow is an essential factor in weed control. The past good season and resultant early and bulky wheat crops must have had a powerful effect upon black oats, and it seems probable that in a drier and less "growthy" year the weed condition of the crops would have been less favourable. The practice of long fallowing paddocks once in every three years is a very sound one and if widely observed will exert a great effect upon the weed menace.

Varieties.

Ford was the outstanding wheat of 1930, being the variety selected by the first and second prize-winners. It is as yet but little known in the north-west, having been recently introduced per medium of Farmers' Experiment Plots. It is South Australian bred, its pedigree being Fan x Comeback x Zealand Blue, and is one of the most widely-grown varieties in that State. It is a mid-season dual-purpose wheat, tall-strawed, high-yielding and claimed to be very resistant to stem rust. It has semi erect, tapering ears, is tip-awned and is said to shatter slightly, but this defect was not noticeable at either Narrabri or Inverell. It is apparently a variety of great promise. Nabawa appeared four times amongst the championship crops, Waratah three times, Aussie, Florence and Gresley each once, while Turvey was represented by two crops in the southern end of the territory (Coonabarabran-Binnaway), where it seems to be very popular.

Disease.

Seasonal conditions were favourable to the development of rust, and it was present in all crops in varying extent. Rust is very largely outside the control of the grower, except that he can concentrate upon resistant wheats, and by good tillage practice make seasonal sowings and check over-heavy growth in time. For the present, it may be wise to pin faith to such wheats as Ford, Nabawa, Waratah, and Clarendon.

Bunt was not noticed in any of the crops inspected; loose smut was present, but to an unappreciable extent; take-all and foot-rot were also observed, but were nowhere doing much damage.

The most striking fact in regard to disease occurrence was the reduction in the amount of flag smut in the crops. For some years past there has been a progressive increase in this disease in the north-west, practically all crops being affected, but this year the occurrence has been exceptionally light. It seems likely that the heavy autumn rains and right temperatures brought about a heavy germination of spores well before wheat seeding. The possibility of a powerful, pericdic, climatic check upon the ravages of flag smut makes the position very hopeful over northern areas.

The Southern Slopes Wheat Area.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

The championship competition conducted this year in the Southern Slopes Division was the most successful in the history of these competitions; not only did the champion crop secure the record total of 150 points, but the average of the points awarded to the thirteen competing crops, representative of the main wheat-growing centres in this division, was also a record. The estimated yields of four crops exceeded 40 bushels per acre, and the average yield of the whole of the crops was 36.69 bushels per acre, which surpasses all previous results.

The district societies which conducted local competitions were:—Albury Burrowa, Corowa, Coolamon, Cootamundra, Culcairn, Henty, Murrumbidgee (Wagga), Murrumburrah, Temora, The Rock (Farmers and Settlers' Association), Yerong Creek (Agricultural Bureau), and Young.

Judging was commenced at Corowa on 1st December and completed at Cootamundra on 5th December.

The Season.

The total rainfall during the growing period was very satisfactory, and approximated to the average in all districts with the exception of Corowa and Culcairn; but this result was contributed to largely by the bountiful rains during October.

While the season proved favourable in most districts to the production of prolific crops, still it was not without its anxious periods, especially at the time of sowing. The rainfall during the first six months of the fallowing period was much below average, and was succeeded by drought conditions during the opening three and a half months of this year, which were particularly severe in the southern portion of the division; for instance, at Culcairn the total rainfall during the three months January to March was only 23 points. As a result, seed-beds were quite dry at the time when the normal sowing period was well advanced, and the subsoil was devoid of a reserve of moisture. Light rain experienced towards the end of April caused trouble in many cases where crops had been sown on dry seed-beds, both by favouring development of mould which destroyed the seed especially when sown deeply, and by providing moisture sufficient for germination but not for a vigorous growth of the seedlings, and these could not penetrate the crust which had formed on the soil surface, but twisted back and turned yellow; in consequence, many stands were very patchy and uneven, and in some instances it was necessary to make a re-sowing. When sowing in a seed-bed which is bone dry the safest practice is to sow as shallow as possible. If rain falls shortly after sowing and before the crop appears above ground, the surface should be broken by a light harrowing.

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* Mr. Stening judged this championship competition.

Intermittent showers and an absence of frosts during the growing period provided conditions favourable for rapid growth, and especially in the north-eastern districts of the division it was necessary to feed the crops off to avoid rankness. A lack of rain in early spring, coupled with the absence of a satisfactory reserve of moisture in the subsoil, was responsible for checking the crops, but these are comparatively late districts, and as the crops were of later maturity than in other parts of the wheat area, they were able better to survive the dry spell and benefit by the rains which occurred early in October, and no material damage resulted. The rainfall during October was the most copious experienced for many years, exceeding 4 inches in most districts, and caused a forced growth, to which much damage was done about the middle of November by strong winds which reached gale force. Not only were losses occasioned by lodging and shedding, but in the heaviest crops, especially in the northern districts, the rapid transpiration of moisture from the tall, soft straw greatly exceeded the rate of supply of moisture from the roots, and in consequence the crops "hayed off." The damage varied according to the maturity of the crops, the grain being more or less pinched, and there were some instances of complete failure.

Since the completion of judging, rains have caused serious delays to harvesting, and much damage has been done to crops, both by reducing the quality of the grain by "bleaching," and also by shedding and lodging, rendering it very improbable that the full yields will be recovered.

The Leading Crops.

The prize-winners were as follows:—

1. J. Mathews, "Wandilla," Bulgandra (Albury Society).
2. W. J. Scott, "Elgin," Munyabla (Henty Society).
3. H. J. Jennings, "Eurunga," Culcairn (Culcairn Society).

Details of awards and of the cultural methods of every competitor's crop are shown in the accompanying table.

Great credit is due to Mr. J. Mathews, the winner of the championship, for the production of the best crop that has ever competed in championship competitions in this State; it gained the highest aggregate points yet awarded in the history of these competitions. It was a very dense, well-headed crop of Yandilla King, which was estimated to yield 44 bushels per acre, and scored maximum points for freedom from weeds. The crop was also of a high standard of purity, and only traces of flag smut, loose smut and foot-rot could be detected. The production of such a perfect crop is the result of good judgment in the application of cultural methods, and in the treatment and the sowing of the seed.

The crop which was awarded second prize was also of great merit, the chief defect being the presence of saffron thistles. It was also of Yandilla King variety and estimated to return the same yield; what it lacked in density in comparison with the champion crop, it was judged to have made up for in improved ear development and better grain sample. Only traces of diseases were discernible in this crop, which was standing very well for such a heavy crop, evidently the result of judicious grazing with sheep till the end of June. The success of this crop can be attributed in no small measure to the practice of rotating other crops with wheat. It was in the year 1925 when the previous wheat crop was grown on the land which was followed in 1926 with a crop of oaten hay; the land was fallowed in 1927 and sown with sorghum, which was fed off; after a disc cultivation in October, 1928, a self-sown crop of sorghum resulted, which was also grazed, and the land springtoothed in July and then ploughed for fallow in August. The humus content of the soil would benefit as the result of the incorporation in the soil of the plant residues of the fodder crops and the droppings of the stock, and furthermore the rotation was an advantage in reducing fungous diseases.

The third prize crop was a very dense and even crop of Waratah, estimated to yield 41 bushels per acre. Considering that the land had been in cultivation for about thirty years, the crop was reasonably free from weed growth and disease, which, no doubt, can be attributed to the fact that a system of rotation with oats is practised.

Lessons from the Competition.

Cultural Methods.—The main factor responsible for the production of the excellent yields in this division was the high standard of farming. Even though the rainfall is more favourable for wheat culture, the cultivation methods generally practised by the farmers in the Southern Slopes Division are better than in any other part of the wheat belt. This applies not only to the cultural methods adopted during the current season, but to the consistent application of good methods generally over many years, and there is evidence of this in the greater proportion of fallowed land than in any other division, indicating that farmers had refrained from interfering with their cultural systems in order to increase the wheat acreages.

In this competition, as in those conducted in the Riverina and western wheat areas, the value of early fallowing has again been clearly emphasised. Both the champion crop and the runner-up, which were the highest yielding crops in the competition, were grown on land which had been fallowed in July, as also was the crop which returned the third highest yield.

An interesting feature disclosed by this competition is the increased attention which is being given to the cultivation of oats in rotation with the wheat crop. Six of the competing wheat crops had been grown in rotation with oats, and of these four were included in the six leading crops in the awards, which were also estimated to return the highest yields in the competition. These four crops were grown on land which had been under cultivation for very many years, whereas the two other leading crops were grown on land which had previously produced only six and seven crops, respectively. The practice of growing oats in rotation with wheat is of value in maintaining the fertility of the soil, and in controlling such diseases as flag smut, take-all and foot-rot, the spores of which are in the soil. When the oat crop is utilised for grazing and the crop residues and sheep

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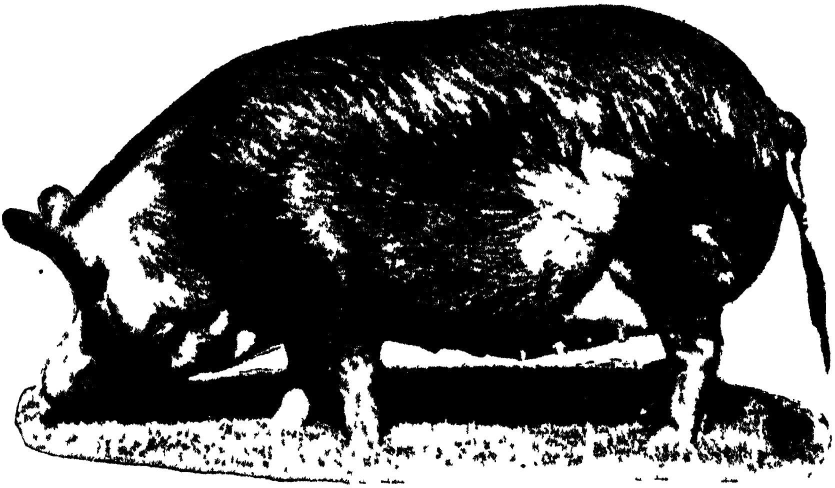

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droppings ploughed in, added advantages are derived by restoring humus to the soil and thus improving its physical condition, as well as in controlling weed growth. There is no better means of ridding a paddock of black oats than by growing oats as a fodder crop.

Varieties.—The varieties represented in this competition were confined to five which are generally recommended for this division. The success of Yandilla King was most outstanding. By virtue of winning the local competitions, six crops of this variety competed for the championship and secured the first, second and fourth places in the awards. Yandilla King upheld its well-deserved reputation as a bag-filler by producing the two highest yields in the competition—44 bushels per acre in each case. The tall crops stood up better against winds than most other tall varieties. It is very rare indeed for Yandilla King to lose grain by shedding; in fact, it is rather tough to strip, and for this reason Marshall's No. 3 is sometimes preferred in the more favoured districts, where the yields of the latter compare favourably.

The season was most favourable to the late-maturing varieties, and this renders the success of Waratah and Nabawa all the more creditable. While Nabawa is a variety to be highly recommended on account of its high-yielding capacity and its resistance to drought, flag smut and rust, still it is not without its defects. This season it proved to be rather susceptible to leaf spot (*Septoria*), and very tall crops exhibited a certain weakness of straw, which resulted in lodging, and occasionally the straw broke just below the ear.

Seeding Operations.—The period of sowing the competing crops varied from the third week in April to the end of May, which is the normal sowing period in this division. Earlier sowings, which had to be made on dry seedbeds, resulted in patchy and irregular strikes, as indicated earlier.

Rates of sowing varied from 60 lb. to 85 lb. per acre; although the heavy rate of 85 lb. of Waratah wheat produced a very fine crop this season, it is considered to be rather too heavy in average seasons, unless for very late sowings. It will be noted that the best crops of Yandilla King resulted from a seeding of 70 lb. and 75 lb. per acre in the last week in April; this variety possesses a large grain, and therefore there are less grains per bushel and a heavier sowing is required than a smaller-grained variety; furthermore, the germination capacity of this variety is sometimes not very satisfactory.

Manuring.—The applications of superphosphate ranged from 63 lb. to 100 lb. per acre, with an average of 81 lb. per acre. In these districts, a rate of 84 lb. superphosphate per acre can be accepted as a good average application, to be varied according to the nature of the soil and the time of sowing, the quantity being increased for light soils and late sowings.

Feeding-off.—The mild conditions during the autumn and early winter were conducive to a very rapid and luxuriant growth of the crops, and six of the competing crops were fed-off by sheep. Where there is a tendency for a crop to grow rank, it is advisable to check the growth by grazing with

DETAILS of Awards—Southern Slopes Division.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops Grown Previously.	Rainfall during Effective Period (April to October).	Points Awarded.						
									Apparent Yield. (One point for every bushel).	Trueness to Type. (Maximum 20 points).	Freedom from Disease. (Maximum 30 points.)	Evenness. (Maximum 20 points.)	Condition. (Maximum 10 points.)	*Cleanliness (Max. 30 points.)	Total Points.
					lb.	lb.		inches							
J. Matthews, Wandilla, Bulgandra.	Albury ...	Yandilla King ...	Ploughed 4 inches July, harrowed August, scarified October and April.	Last week April.	75	80	7th crop.	...	44	19½	28½	19	9	30	150
W. J. Scott, Elgin, Munyabla.	Henty ...	Yandilla King ...	Springtoothed July, ploughed 4 inches August, springtoothed October, harrowed January. Crop fed off to end of June.	Last week April.	70	93	Over Six.	12·66	44	19	28½	19	9½	26	146
H. J. Jennings, Burunga, Culcairn.	Culcairn ...	Waratah ...	Ploughed 4 to 5 inches August, harrowed October, scarified end April.	20th May	85	85	Very old land.	...	41	18½	29	19	9	28	144½
James McEwin and Sons, Ewin Vale, Marrar.	Wagga ...	Yandilla King ...	Ploughed 4 inches September-October, harrowed November, springtoothed March-April.	Mid-May	70	90	8th crop.	11·02	38	19	29	19	8½	29½	143
H. C. Yates, Aberdeen, Yerong Creek.	Yerong Creek. (Agricultural Bureau).	Nabawa (25 acres), Turvey (25 acres).	Ploughed 4½ inches July, harrowed September, springtoothed October and May.	Second week May.	75	84	Very old land.	...	42	18	28½	18½	8½	27	142½
Stan Lucas, Springfield, Coolamon.	Coolamon ...	Nabawa ...	Ploughed 3½ inches August, springtoothed October, harrowed three days after sowing.	Third week May.	65	65	Old land.	...	38	18	29	17	8	25	135
Reg. Stocks, Linden Hills, Cunningar.	Murrumburrah.	Marshall's No. 3	Ploughed 5 inches June-July, scarified full depth first week October, scarified shallow and harrowed January, scarified shallow April. Crop fed off to 7th August.	Third week April.	60	84	Old land.	...	34	19	27	18	8	27½	133½
A. A. Gorham, Dundungara, Boorowa.	Burrowa ...	Waratah ...	Ploughed 3½ to 4 inches early September, springtoothed January, crop fed off lightly to end July.	Mid-May	60	83	2nd crop.	...	35	18	27	19	8	23 (25)	130

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points. In parentheses is shown the maximum in each case.

DETAILS of Awards—Southern Slopes Division—*continued.*.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops Grown Previously.	Rainfall during Effective Period (April to October).	Points Awarded.						
									Apparent Yield. (One point for every bushel).	Trueness to Type. (Maximum 20 points).	Freedom from Disease. (Maximum 30 points.)	Evenness. (Maximum 20 points.)	Condition. (Maximum 10 points.)	*Cleanliness (Max. 30 points.)	Total Points.
W. Moiler, c.o. J. H. Kendall & Sons, Myarba, The Rock.	The Rock (Farmers' and Settlers' Association).	Waratah ..	Ploughed 5 inches September, harrowed October and harrowed twice in April.	End May	lb. 80	lb. 90	Old land.	inches, ...	34	17	26	19	9	25	130
G. H. Coddington, Rosebank, Kingsvale.	Young ...	Yandilla King ..	Ploughed 4½ inches September, harrowed after ploughing, springtoothed November and January, and end February, crop fed-off to end May.	First week May.	60	100	7th crop.	14·24	36	18½	28	15	7	25	129½
L. Donaldson, Bartondale, Temora.	Temora .	Yandilla King ...	Ploughed 4 inches August, harrowed twice September, springtoothed January, harrowed end April.	Second week May.	60	70	Very old land; 3rd crop since being spelled seven years.	.	32	19	25	19½	9½	24 (26)	129
J. H. Kingston Merry Vale, Coreen.	Corowa ...	Yandilla King ...	Ploughed 4½ inches July-August, springtoothed October, March, and prior to sowing. Crop fed-off to end June.	Mid-May	60	63	Old land.	...	23	19½	27	19	10	26	124½
V. Boxsell, Bellevue, Cullinga.	Cootamundra.	Marshall's No. 3	Ploughed 2 inches September-October, springtoothed October, harrowed March, crop fed off to end June.	Early May	70	66	Very old land.	...	36	19	22	16	5	22	120

* First crop, 24 points; second, 25; third, 26; fourth 27; fifth 23; sixth, 29; over six crops, 30 points. In parentheses is shown the maximum in each case.

sheep, but it is a practice that requires much judgment, and there was evidence that errors had been committed this year. One crop of Yandilla King sown in mid-May should never have been fed-off, and as a result of the grazing the crop was very thin and weeds had been allowed to assert themselves; another crop apparently had been allowed to make too much growth before the sheep were put on, and in consequence the rankest patches were not touched and a patchy crop resulted.

Diseases.—The whole of the competitors adopted the dry copper carbonate treatment of the seed for the prevention of bunt, and in only one crop was bunt detected. In this case it was found that the seed had been treated in a machine of the gravity type which has previously been found unsatisfactory, in that the grain was not effectively covered with dust. In order to ensure complete protection from infection, it is essential that the whole of the grain should be thoroughly coated with the powder.

With the exception of three crops which were materially infected with flag smut, the losses as the result of disease were not a serious matter. Take-all and foot-rot were in evidence in several crops, but in no instance to a very appreciable extent. Fortunately, the best measures for the control of these three diseases are good farming methods, which also make for the production of high yields, namely, a rotation of crops and the preparation of a firmly compacted seed-bed.

Central Slopes Area.

E. S. CLAYTON, H.D.A., Senior Experimentalist.*

THERE were twelve entries for the Royal Agricultural Society's Cup for the champion wheat crop of 50 acres grown on fallow in the Central Slopes Area. The yields throughout the competition were very high—the average estimated yield of the twelve crops was 33.9 bushels. This average in a year when disease, especially rust, was prevalent is most satisfactory.

The Season.

The following table gives the rainfall registrations at the different centres:—

District.	On the Fallow.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Total.
	Points.	Points.	Points.	Points.	Points.	Points.	Points.	Points.	Points.
Cowra	1,217	151	126	208	248	161	56	397	1,347
Cudal	979	80	166	190	225	245	55	396	1,357
Forbes	1,400	47	200	202	267	167	21	345	1,249
Grenfell	...	...	106	225	95	196	145	436	1,203
Molong	1,548	...	150	404	294	133	10	425	1,416
Parkes	1,051	63	138	232	236	174	6	353	1,202
Wellington	600	52	131	304	257	169	55	351	1,319

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* Mr. Clayton judged this championship competition.

The first few weeks in April were very dry, but rain fell during the last week. Most of the crops were sown after the rain, either in late April or May. The soil was still warm and the ample autumn rains ensured an excellent germination. Good rain was received each month until the spring. September was a very dry month, and many crops right throughout this area commenced to show signs of distress. The October rains saved the situation, and from then on rain was plentiful. In fact too much rain was received after that date, and this factor combined with the sultry weather was responsible for a severe outbreak of rust. Fortunately, the moist warm conditions did not continue, and although almost all the crops showed rust infection, the yields in this area, except in a few instances, were not seriously reduced by rust.

During November some severe winds were experienced and many of the crops nearing maturity had some grain shattered. Ripe crops of Waratah suffered in this way. This variety shatters rather readily. Nabawa appears to be a little less liable to shattering than Waratah. The winds in some cases were so severe as to cause shattering of the tips of such a tough variety as Yandilla King. In some cases the "haying-off" of portions of crop was caused by severe cold winds in late October and November.

In spite of these instances of unfavourable weather the season as a whole must be regarded as favourable, chiefly because of the ample winter rainfall. Generally speaking, the yields were very satisfactory, while the leading crops gave promise of some particularly heavy yields at time of judging. The lowest estimated yield in the competition was 30 bushels and the highest yield was in Mr. P. C. Byrne's crop of Waratah at Canowindra, which was estimated to yield 40 bushels per acre.

Methods Employed by Leading Competitors.

Messrs. C. W. Reid and Son, of Molong, won the competition by a margin of two points with a very fine crop of Waratah, which was estimated to yield 38 bushels per acre. It was clean and true to type and the sample of grain was excellent. It not only promised to yield well, but was also particularly pleasing from the point of view of pure seed. It scored high for freedom from disease and was very even. It was grown on a fertile reddish-brown loam which originally carried white box timber. The land was ploughed with a mouldboard plough to a depth of 4 inches in June; it was then harrowed in the same month, springtooth cultivated and harrowed in October, springtoothed and harrowed in January, springtoothed and harrowed and sown on 1st May. The seed had been graded and treated with dry copper carbonate to prevent bunt, and was sown at the rate of 53 lb. of seed per acre with 56 lb. of superphosphate. The germination was excellent and the growth was most satisfactory. The crop was particularly dense and the heads well filled and heavy.

Messrs. C. G. Shaumer and J. R. Jackson, of Geurie, gained second place with a crop of Nabawa. The land had been under cultivation and had been eaten off in September and springtooth cultivated to a depth of 4 inches. It was again cultivated shallow with a springtooth in February, harrowed in March and sown with a combine on 15th April at 60 lb. seed and 60 lb. superphosphate per acre. The land was a reddish-brown loam, very strong in texture and containing many stones; but in spite of its somewhat stony appearance it was nevertheless a very fertile soil. The germination and growth were most satisfactory and the crop suffered little from disease. Stem rust was very prevalent, but its development had been checked by drier weather conditions and damage was prevented.

A particularly dense and heavy crop of Waratah, grown by Mr. P. C. Byrne, of Canowindra, was awarded third place. It was grown on a light brown loam of light to medium texture, on which the original timber was yellow and white box. The land had been fallowed in September with a mouldboard and disc plough to a depth of 4 inches, harrowed in November, rigid-tine cultivated in December, harrowed and sown with a combine on 20th May at 64 lb. seed and 45 lb. superphosphate per acre. The germination was excellent and the crop was just a wall of wheat. The heads were long and well filled and it was estimated that the crop would yield 40 bushels per acre.

Varieties.

The varieties entered in the competition were typical of the most suitable wheats for the Central Slopes Area. There were three entries of Waratah, three of Nabawa, three of Yandilla King, two of Turvey, and one of Marshall's No. 3. The heaviest yielding crops were of Waratah, which were estimated to yield 40, 38 and 36 bushels per acre. This variety has again demonstrated its adaptability to varying soils and climatic conditions and its ability to give very heavy yields where conditions are favourable. Crops of Waratah seemed to withstand the dry period in September in a very satisfactory manner, and when the rain came in October they quickly recovered. The variety's worst faults are its susceptibility to flag smut and its tendency to lose grain by shattering in heavy winds.

Nabawa is rapidly gaining in popularity. Its resistance to flag smut is marked, and although odd plants of this variety may show infection, the disease did not affect the crops to any extent commercially. This variety is reasonably drought-resistant, and is capable of giving very high yields. Combining so many desirable qualities, it was only to be expected that Nabawa should replace many of the old varieties in cultivation that were susceptible to flag smut. It is a variety that can be tried with all confidence by farmers in districts where flag smut is severe. So far Nabawa has not exhibited any very serious commercial defects. Up to the present one of its greatest faults is the tendency of many of the straws scattered right throughout a crop to break off near the ground during severe winds. When ripe, the heads shell to some extent in the wind, but not nearly to the same extent as those of Waratah.

Yandilla King still maintains its reputation as a late maturing variety. This season it seemed to suffer somewhat from "haying-off," but this may be due chiefly to its late maturity. "Haying-off" was also noticed in crops of Turvey. The tips of this variety were also shattered by the wind, and rust was fairly prevalent in Turvey crops.

DETAILS of Awards—Central Slopes Area.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre	Number of Crops Grown Previously.	Points Awarded.						
								Apparent Yield. (1 point for every bushel).	Trueness to Type (max., 20 points).	Freedom from Disease (max., 30 points).	Evenness (max., 20 points).	Condition (max., 10 points).	* Cleanliness (max., 30 points).	Total Points.
					lb.	lb.								
C. W. Reid and Son, "Killamont," Molong.	Molong ...	Waratah	Mouldboard ploughed 4 inches in June, harrowed June, springtoothed and harrowed in October, January, and again on 1st May.	1 May	53	56	Old	38	19	28	19	7	24	135
C. G. Shaumer and J. R. Jackson, "Geurie Homestead," Geurie.	Wellington	Nabawa ..	Eaten off in September. springtoothed 4 inches in October. again shallow in February, harrowed March; sown with combine.	15 April	60	60	Old	34	18	28	18	8	27	133
P. C. Byrnes, "Bellvale," Burdette.	Canowindra	Waratah	Mouldboard ploughed 4 inches deep in September, harrowed November, scarified December, harrowed May, sown with combine.	20 May	64	45	Old	40	17	26	17	8	24	132
Cudgelo Pastoral Co. and A. Newham, "Nella," Cowra.	Cowra ...	Waratah	Mouldboard ploughed July 4½ inches, harrowed and springtoothed October, disced March, springtoothed April.	1 May	62	50	Old	36	18	27	18	7	25	131
W. B. Cheney, Parkvale, Parkes.	Parkes ...	Turvey ...	Mouldboard ploughed 4 inches deep in August, scarified 3 inches in March, harrowed April, sown with combine.	20 May	60	60	Old	32	19	26	18	8	28	131
J. Rawsthorne, Back Tomanbil, Forbes.	Forbes ...	Nabawa ..	Mouldboard ploughed March, 1929, 4 inches deep, springtoothed September 3 inches, again in January, again March, harrowed March, sown with combine.	5 May	60	50	6	30	18	28	18	9	27	130
S. J. Reynolds and L. Stark, "Burrawang," Cumnock.	Cumnock ...	Marshall's No. 3.	Disc ploughed 4 inches, springtoothed three times before sowing, sown with combine.	25 April	60	60	Old	33	17	27	18	8	27	130
F. T. Gray, "Renown," Greenethorpe.	Grenfell ...	Yandilla King.	Mouldboard ploughed August 4½ inches deep, springtoothed 2 inches January, sown with combine and harrowed.	19 May	60	105	Old	32	17	28	18	8	24	127
J. C. Dowling and E. G. Patrick, "Glenelga," Gumble.	Manildra ...	Turvey ...	Mouldboard ploughed 3½ inches deep in September, springtoothed February (deep), sown with combine.	28 April	64	64	1st crop (after grass).	37	18	25	16	7	23	126
R. Balcomb, "Sussex," Toogong.	Cudal ...	Yandilla King.	Disc ploughed August 4½ inches, harrowed October, springtoothed January 2½ inches, again February, sown with combine.	5 April	70	60	Old	33	18	25	17	8	24	125
T. Curtis, "Killara," Tubbul.	Bribbaree ..	Nabawa ..	Mouldboard ploughed 4 inches September, Springtoothed January, harrowed twice in May.	20 May	75	70	1st crop.	32	19	27	17	7	21	123
J. Mahon, "Pine View," Quandialla.	Quandialla	Yandilla King.	Springtoothed twice October, 3½ inches deep, harrowed twice in January, springtoothed shallow in February, springtoothed in April.	28 April	70	70	3	30	17	25	17	8	25	122

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points.

Comments.

Most of the fallows had been worked with great judgment, and sheep were used in all instances to clean the land and reduce the number of cultivations. Rain was plentiful in November and December, 1929, and the fallows were cultivated after these rains. Little cultivation was necessary early in 1930, as the weather was very dry; January, February, and March were extremely dry. The fallows were worked up prior to sowing with harrows, springtooth cultivators or rigid-tine scarifiers. Weeds were not troublesome on the fallows in the early part of the sowing season, the land being very clean, and many good germinations were obtained by using the drill for sowing. Combines, however, were used in some instances in the competition, and where care was exercised a good germination resulted. When the combine is used it is a good practice either to attach light harrows to the machine or immediately harrow the land lightly. This system of sowing was adopted by some of the competitors.

The dry autumn prevented the early germination and destruction of black oats and many weed seeds germinated with the wheat. The consequence was that black oats and other weeds were particularly noticeable in commercial wheat crops this year. In the competition crops, however, black oats were not particularly troublesome. It is probable that the good germination in these crops and the dense growth did much to minimise the growth of the pest. There is no doubt that the best farmers used this means to check black oats. Their concern was to bring about a set of conditions in the fallow at sowing time which would be most favourable to the wheat. This, combined with a heavy seeding, ensures a good germination and vigorous early growth, with the consequence that black oats are practically choked out.

Western Wheat Area.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

Ten district competitions were conducted in the western wheat area, which is an increase of three on the previous year's number. The societies represented were Bogan Gate, Condobolin, Dubbo, Gilgandra, Narromine, Peak Hill, Trundle, Tullamore, Tullibigeal (Agricultural Bureau), and Ungarie.

The adverse conditions which were experienced in the south-western portion of this division resulted in a partial failure of the crops, and prevented two societies from holding competitions. Judging was commenced at Gilgandra on 10th November, and completed at Ungarie on 13th November.

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* Mr. Stening judged this championship competition.

An Erratic Season.

The seasonal conditions in this division can be regarded as most erratic. Following on three seasons of abnormally low rainfall, droughty conditions continued throughout the fallowing period, and, except in the more northern parts of the division, there was no definite break until late autumn, with the result that germination was delayed, and the crops were obliged to subsist on the moisture from showers which fell from time to time during the growing period, there being no reserve of subsoil moisture in the event of a dry spell. As mentioned, there was a variation in this respect as regards the northern districts of Dubbo, Gilgandra, and Narromine, where serviceable rains were registered during the first three months of the year, very good falls being experienced in January. For instance, the rainfall registrations during the three months January to March totalled 638 points at Dubbo in the north, as compared with a total of only 44 points at Ungarie in the south. These northern districts, therefore, had an advantage by reason of the fact that the late summer rains supplied satisfactory conditions for the preparation of a good seed-bed, ensured a good germination, and, moreover, by saturating the subsoil and supplementing the rainfall during the growing period, they enabled the crops to better withstand the dry conditions which were experienced in the early spring. This increased soil moisture, however, coupled with the absence of frosts and the exceptionally mild weather conditions which were experienced during the winter, favoured a rapid rank growth, rendering the crops susceptible to damage by disease and adverse weather conditions. As a matter of fact, much loss was occasioned to the crops in these districts as the result of severe infection by stem rust and of frost damage.

The following table gives a comparison of the rainfall registrations of the different districts, as supplied by the Weather Bureau:—

RAINFALL Table.

District.	Fallow Period (June, 1929, to March, 1930).	Growing Period							Total.
		April.	May.	June.	July.	August	Sept.	Oct.	
	points.	points.	points.	points	points.	points.	points.	points.	points.
Gilgandra ...	1,152	82	136	357	335	135	47	359	1,451
Dubbo	1,386	80	135	153	292	212	37	435	1,344
Narromine ...	1,207	45	86	661	252	...	39	236	1,319
Trundle	858	54	91	279	136	263	7	334	1,164
Bogan Gate ...	818	82	91	279	174	163	...	270	1,059
Ungarie	878	83	149	168	104	135	24	372	1,035

The Leading Crops.

The particulars of the prize-winners are as follow:—

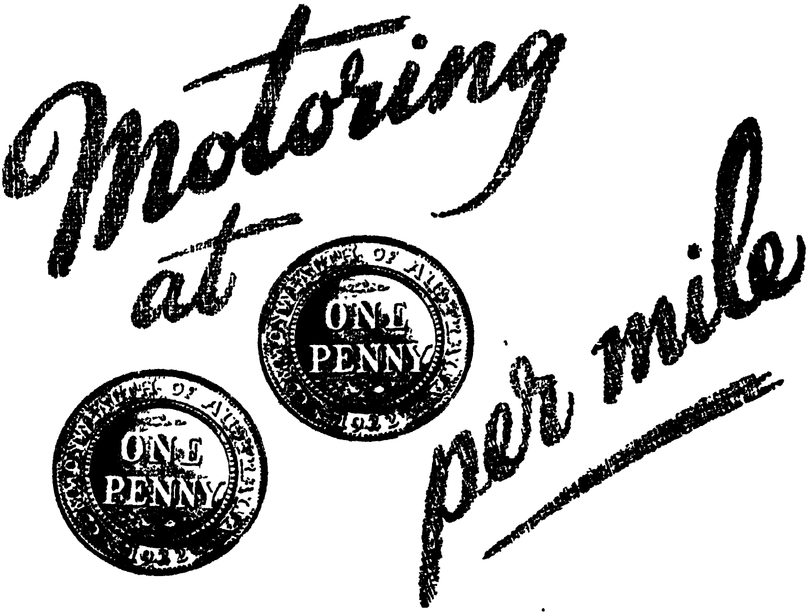
1. **Evan Jones, "Iona,"** Narromine. (Narromine Society).
2. **L. J. Matthews, "Noorla,"** Trundle. (Condobolin Society).
3. **P. Fallon, "Nilma,"** Curban. (Gilgandra Society).

Details of awards and of the cultural methods of each competitor's crop are shown in the accompanying table.

DETAILS of Awards—Western Wheat Area.

Name and Address of Competitor.	Society.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops Grown Previously.	Rainfall during Effective Period (April to October).	Points awarded.						Total Points.
									Apparent Yield. (One point for every bushel).	Trueness to Type. (Maximum 20 points).	Freedom from Disease. (Maximum 30 points.)	Evenness. (Maximum 20 points.)	Condition. (Maximum 10 points.)	*Cleanliness (Max. 30 points.)	
Evan Jones, Iona, Narromine.	Narromine	Nabawa ...	Fallowed 1928; crop failed in 1929 and fed off; springtoothed January.	End of April.	lb. 60	lb. 38	Over 6	inches 10·58	41	18	28½	18½	8½	29	143½
L. J. Matthews, Nooria, Trundle.	Condobolin	Nabawa ...	Disc-ploughed June-July 4 inches deep, springtoothed in September and twice in October, February, March and in April.	End of April.	52	50	Old land.	...	39	19	29	18	8½	26	139½
P. Fallon, Nilma, Curban.	Gilgandra	Canberra (30 acres), Waratah (30 acres).	The 1929 crop failed and was fed off; springtoothed in October, also in December, January and March	Mid-May	42 to 45	36	Old land.	12·93	33	19	28½	17	8	29	134½
J. J. and C. McMaster, Rosewood, Bogan Gate.	Bogan Gate	Nabawa ...	Disc-ploughed in August 4 inches deep, springtoothed October and in January.	First week in May.	60	56	Over 6	10·98	31	17½	29	18	9	28	132½
A. G. Manning and T. Bannon, Irriga, Ungarie.	Ungarie ..	Ranee	Disc-ploughed August-September 4 inches deep, springtoothed in October, harrowed in March.	Last week in April.	50	50	7th	..	29	19	29½	18	8½	28	132
G. D. Williams, Kelvin Grove, Fifield.	Tullamore	Sultan	Cultivated with combine in October 2½ inches deep, and springtoothed in March.	27th April	50	50	Very old land.	. .	36	16	28	17	8	25	130
F. J. Furney, Dubbo.	Dubbo ...	Nabawa ...	Disc-ploughed in June 3 inches deep, springtoothed, rolled and disced in July, springtoothed in January and March, and harrowed after sowing.	30th April	48	Nil	Very old land.	...	34	18½	29	18	8	20	127½
T. E. Porter, Steeton, Trundle.	Trundle ...	Waratah .	Disc-ploughed in September 4 inches deep, springtoothed in February and March.	10th May	44	55	4th	...	28	18½	26½	19	9	26 (27)	127
S. M. Kramer and Sons, Reedy, Trundle.	Peak Hill ...	Waratah ..	Disc-ploughed in August-September 4 inches deep, springtoothed in October and January, and harrowed in February.	Second week in May.	55	35	1st .	...	31	17½	28½	17	8	24 (24)	126
H. M. Hamling, Rosedale, Tullibigeal.	Tullibigeal	Nabawa ..	Disc-ploughed in September 3 inches deep and springtoothed in October.	End of April.	45	45	Over 6	9·52	22	18½	29	19	8	28	124½

* First crop, 24 points; second, 25; third 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points. In parentheses is shown the maximum in each case.



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The entry which won the championship was a dense crop of Nabawa standing over 4 feet high, with well-developed heads, and estimated to return the heavy yield of 41 bushels per acre. Some ears had been affected as the result of frost damage, and although there was a light infection of stem rust, a satisfactory sample of grain was produced. The soil is a red clay loam, which was originally timbered with box and pine, and the winning crop was grown on land which had practically been under fallow for nearly two years; it was fallowed in 1928 and sown with wheat in 1929, but as the crop had failed it had been grazed with sheep and the land treated as a fallow. Although a few Waratah strangers were present, the crop was up to pure seed standard, and as is customary with this variety, it was free from flag smut. There was little infection with loose smut, and except for a very occasional black oat the crop was free from weeds.

The second prize crop, which was also of the Nabawa variety, was tall and dense, with good heads well filled with plump grain. There was a little loose smut and a trace of stem rust, but insufficient to cause any loss, and the yield at time of judging was estimated at 39 bushels per acre. The chief marring factor was the presence of wild oats and wild mustard, which had persisted in spite of good cultivation.

The crop which won third prize consisted of 30 acres of the Canberra variety and 20 acres of Waratah, and was of a high standard of purity. It was well grown, fairly dense, and estimated to average 33 bushels per acre. There was a liberal infection of stem rust, and the heavier patches of Waratah had hayed off, but the general sample of the grain which was ripe at the time of judging was quite satisfactory. The crop was very free from weeds, and the most remarkable feature was the freedom from flag smut of these two varieties, which are so susceptible to the disease. The crop, which had lodged in a few patches, was grown on what might be termed a "compulsory" fallow; that is, the land had produced a crop of wheat in 1928, but the crop sown in 1929 failed, and was fed off and the land treated as a fallow.

Lessons from the Season.

Fallowing.—In no instance did a competitor use a mouldboard plough for the purpose of the initial ploughing of the fallow. The preference for disc implements is one of the chief points of difference in the cultivation methods followed by the farmers in this division and those adopted in southern districts. The mouldboard plough generally performs better work in inverting the furrow slice and burying weeds and trash, which will decompose and form humus, and is also to be preferred on soils which have a tendency to break up too fine, for disc implements leave a finely pulverised surface, which has a tendency to run together after heavy rains. However, what is of more importance than the type of implement with which the ploughing is performed is that the operation should be carried out early, and completed, if possible, before the end of July. It is interesting to note that the three prize-winning crops were grown on fallows that had been commenced before July, 1929, and of the five crops in the competition which yielded 11 bags per acre or over, only one was produced on a fallow commenced later than July. The winter months are the best time for fallowing, for the rate of evaporation is at its lowest and a longer period is allowed for the absorption of moisture, for the mellowing of the soil, and for the preparation of a well-compacted seed-bed. Too frequently, as occurred in some districts last year, the soil dries out rapidly in the spring, and the land cannot be ploughed in satisfactory condition.

In consequence of the very dry conditions which prevailed during the fallow period, very few cultivations of the fallow were necessary. The rainfall, almost generally, was too light to render the soil mulch ineffective, and there is nothing to be gained by cultivating a fallow except with the definite object of renewing the mulch or of destroying weed growth.

Varieties.—Nabawa has proved to be the most successful variety in this competition. Of the ten crops competing for the championship (for which they are eligible by reason of winning the local competitions), five were of Nabawa variety. Crops of this variety won the championship and the second prize with yields of 41 bushels and 39 bushels per acre respectively, and also filled fourth place. Coupled with its outstanding success in the previous year's competition in this division, Nabawa has put up a splendid performance, and can be recommended as eminently suitable to the conditions in this part of the wheat belt. It resisted the dry spring conditions in a remarkable manner, and headed out very satisfactorily instead of the ears being caught in the sheath as in the case of most varieties. Again it confirmed its reputation for immunity to flag smut under field conditions, and in addition this season demonstrated a greater degree of resistance to stem rust than any other variety in general cultivation.

Waratah also met with a measure of success; it figured in three entries and formed a portion of the third prize crop. As in previous seasons when stem rust was prevalent, Waratah again demonstrated its capacity to resist rust and produce a satisfactory sample of grain. It is unfortunate that this variety has a tendency to shed its grain and is susceptible to flag smut.

This is the first time that Ranee and Sultan have appeared among the crops competing for the championship, and in view of the comparatively small area of these varieties in cultivation their success is all the more significant. They have been under test for several years, and although results have been fairly satisfactory they have not been able consistently to outyield standard varieties.

Seeding Operations.—The period of sowing of the competing crops was from the last week in April to mid-May, and taken in conjunction with the previous year's results it may be regarded that mid-April to mid-May is the best time for sowing in these districts. This year crops sown earlier were more subject to frost injury, especially in the case of early-maturing varieties, while those sown later were subject to damage by rust.

The rates of seeding varied from 42 lb. to 60 lb. per acre, the highest quantity being used by two competitors when sowing Nabawa. This variety possesses a large grain, and requires to be sown at a higher rate than smaller-grained varieties.

With the exception of the Dubbo entry, which was unmanured, superphosphate was applied to all crops at rates ranging from 33 lb. to 56 lb. per acre. The unmanured crop was tall and heavy, and estimated to yield 34 bushels per acre, but it is possible that even a better crop would have been produced had an application of superphosphate been made.

Diseases.—In this division stem rust was responsible for greater losses than any other disease, and considerable damage was occasioned to crops in the northern portion, especially between Dubbo and Gilgandra. It is probable that the good rains experienced in these districts during the early part of the year were conducive to the severe infection of rust in the spring, additional soil moisture and the mild winter conditions promoting a soft and susceptible growth and also increasing the moisture in the air layer surrounding the crop. In districts further south, where the late summer and the autumn were dry, the crops were only lightly infected with stem rust, and as they were almost ripe no very appreciable damage was anticipated at time of judging.

In awarding points for freedom from disease, a heavy penalty was not imposed for the presence of rust for the reason that infection of crops by rust is largely dependent on weather conditions, which are not under the control of the farmer. The only practical method of control is the use of varieties that are resistant to the disease, but even then there is some doubt and difficulty, for there are several known biologic forms of rust in New South Wales (in England and America the forms are more numerous), and a variety may be resistant to the form that was responsible for the damage this season, but susceptible to other forms which may be prevalent in another season. The varieties generally cultivated which showed the greatest degree of resistance (no varieties were immune) were Nabawa and Waratah. It is fortunate that these are both excellent grain yielders and are well suited to the soil and climatic conditions, not only of this division, but throughout the greater part of the wheat belt, for the cultivation of a variety merely on account of rust resistance could not be recommended, as it is only occasionally that serious losses are incurred as the result of rust infection, fourteen years having elapsed since the previous severe rust epidemic was experienced in these districts. A variety that was even more resistant than the varieties mentioned is Ford. It is being tested on experiment plots, and besides promising to be of high-yielding capacity it is fairly resistant to flag smut.

Losses as the result of infection by flag smut were not great; the crops of Nabawa were all free from the disease, but the Waratah crops were more or less infected, with the exception of the composite crop of Waratah and Canberra at Gilgandra. In this case the fredom from flag smut of these two very susceptible varieties are attributed to a rapid germination as the result of the preparation of a well-compacted seed-bed.

Varieties of Wheat in New South Wales.

[Continued from page 19.]

J. T. PRIDHAM, H.D.A., Plant Breeder, and A. R. CALLAGHAN, D.Phil., B.Sc , B.Sc.Agr., Assistant Plant Breeder.

IN the two previous instalments of this article Waratah, Federation, Yandilla King, Turvey, Canberra, Nabawa, Bena, Marshall's No. 3, and Penny were described and illustrated.

As in the preceding instalments, the varieties described herein are given in the order of their relative importance in New South Wales at the present time.

Hard Federation.

Hard Federation resulted from a selection made in the stud plots at Cowra Experiment Farm in 1908 from a row of Federation. Its origin and subsequent behaviour indicate that it arose as a natural crossbred, probably between Federation and the variety Comeback. It was named in 1914.

The variety is semi-erect in early growth; the foliage is abundant, never stiffly-erect like Federation, but drooping and wavy with long leaf-blades. The straw stands stiff and the heads are borne erectly; the variety is readily distinguished from Federation in the field if cognisance is taken of the drooping foliage. The straw has a brownish tinge which prejudices its value for hay; it is of medium height and stoutness, strong and not liable to lodge

The brown ear is totally bald and resembles very closely that of Federation; the head is slightly more lax than Federation. In contrast to Union, the rachis of the spike is fringed with conspicuous hairs. The outer glumes are rather short and wide with medium-wide square shoulders. The grain of Hard Federation is plump, semi-hard to hard, and ovate, with a shallow crease and rounded cheeks. The grain of Federation is normally softer and less flinty than Hard Federation.

It is not as productive as Federation; being a week to ten days earlier it should be regarded as an early wheat to be compared with standard early varieties rather than with Federation or other mid-season wheats. It is highly susceptible to rust and flag smut, and appears also to suffer heavily from foot-rot under conditions favourable for this disease.

In 1925 it held the sixth leading position in point of acreage in New South Wales, but its popularity since then has waned and it now holds the tenth position. Hard Federation is likely to decline further in popularity despite its good quality grain.

It is now recommended by the Department only for the Western Plains for early sowing for grain and hay.

Union.

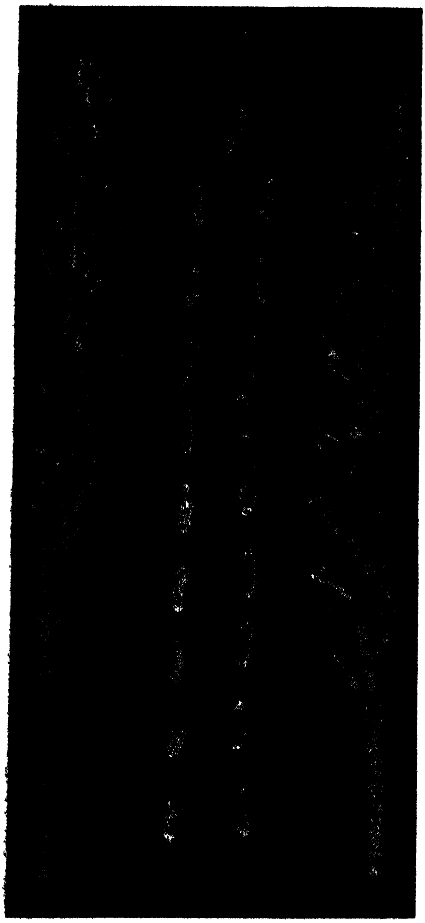
Union owes its origin to a cross made between Federation and Nullah at Cowra Experiment Farm in 1914. It was named in 1921. The parent Nullah has a long pedigree, with Fife-Indian and Purple Straw the predominating strains.

Throughout its growth and even at maturity, Union resembles Federation very closely. The similarity is the more striking because of the stiff-erect foliage, straw, and ear characters that are distinctive features of these two varieties. It has short straw which limits its value for hay purposes, but like Federation is deserving of the name "storm-proof" because of its standing ability in severe weather.

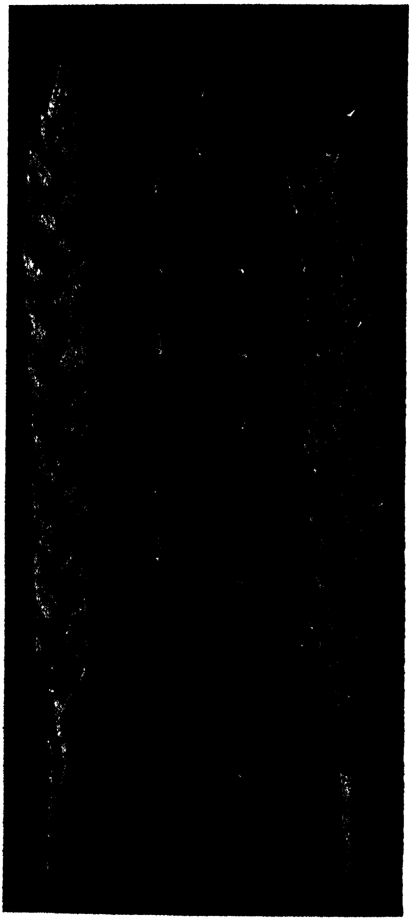
It is a mid-season variety with a completely bald ear, brown in colour, and very dense. According to ear measurements and spikelet counts, Union is denser than Federation to the same extent that Federation is denser than Hard Federation. The increased density is mainly located in the ear-tip, giving it a more compact appearance than either Federation or Hard Federation. The more compact tip, however, is not always discernible, but when evident, it can be relied upon for identification purposes. The glumes are lightly glaucous, and the shoulders of the outer glumes are wide and square. The rachis of the spike, to the naked eye, appears glabrous, the hair fringe being very short and inconspicuous; this character is in contrast with the long hair-fringe of the rachis of Federation and Hard Federation. The grain is white, medium-sized, and ovate, with a shallow crease and rounded cheeks; it borders on the medium-strong flour class.

Union is an ideal grain wheat, strips well, bleaches less than Federation, but is quite as susceptible to rust, flag smut, foot-rot, and leaf blight (*Septoria*).

The variety has grown rapidly in popularity since 1925, when only 1,726 acres were grown in New South Wales. In 1929 there were 108,944 acres of Union wheat under crop in this State, chiefly in the Central and South-western Slopes and Riverina, where, on account of its higher productivity, it is displacing Federation. Though superior to Federation and a great yielder, its extreme susceptibility to disease will prevent it from attaining much greater popularity.



Union.



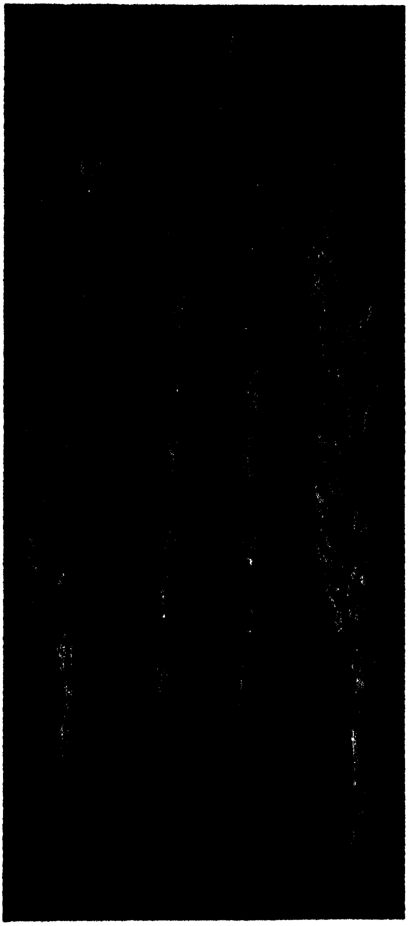
Free Gallipoli.

Union is at present recommended by the Department for early and mid-season sowing for grain on the South-western Slopes and Riverina, the South-western Plains and Western Riverina, and on the Central-western Slopes.

Free Gallipoli.

A cross between Club and Yandilla King evolved by the Victorian Department of Agriculture received the name Gallipoli; finding it hard to thresh, a better stripping strain was selected at Werribee Research Farm, and this received the name of Free Gallipoli.

Free Gallipoli is a few days later than Federation, but not as late as Yandilla King. It grows with erect, stiff foliage, and strong, stiff, short to medium-short straw, which is not subject to lodging. It is a good stooling variety, producing a compact well-rooted crop.



Nizam.

Currawa.

The ear of Free Gallipoli is brown, tip-awned and dense, especially at the tip where it is somewhat square and often lightly clubbed. The outer glumes are short and medium-wide with rounded shoulders. The dark-yellow, opaque grain is ovate, with rounded cheeks and shallow crease; it is included in the weak flour class.

Free Gallipoli is highly susceptible to flag smut, susceptible to rust, and to leaf blight (*Septoria*). Being a late-maturing wheat, early sowing is necessary for its best growth; this increases the risk of loss from flag smut, as it is extremely liable to this disease.

Free Gallipoli is now the leading variety in Victoria, having displaced Federation from this position. It is a very productive variety in the south; its record shows that from 3,362 acres grown in New South Wales in 1925, its culture has extended to 95,777 acres in 1929. Flag smut susceptibility is, however, likely to impede its progress.

Nizam.

Nizam was bred by the Victorian Department of Agriculture from a cross between Indian 17 and Federation.

It is a very short-strawed, erect type, producing very compact medium-stooled plants. The brown, quite awnless ear is distinguished from Federation or Union by its decidedly club-shaped tip; it is very dense. The outer-glumes are short and have wide, very square shoulders. The ear is never so broadly clubbed as Duchess.

Nizam is highly susceptible to rust and flag smut. It has nothing to commend it by comparison with Federation or Union for any part of New South Wales. The area sown to this variety in New South Wales was 67,092 acres in 1929, its growth being chiefly limited to the southern border districts.

Currawa.

Currawa was bred at Dookie Agricultural College, Victoria, and has the pedigree (Northern Champion x Cretan) x Little Club.

The foliage of Currawa is dark green and grows erectly with short leaf-blades. The stems are very glaucous prior to maturity, but in spite of an erect habit the straw is liable to lodge because of its thin walls and brittleness.

Currawa possesses a dense, bold, clubbed, white ear bearing tip-awns. The outer glumes are medium-long and wide with rounded shoulders; this character is in contrast with the narrow sloping shoulders of Penny and the slightly elevated shoulders of Minister. The large grain of Currawa is also distinct, being angular, hump-backed, and with a deep, distinctly pitted crease; it is more subject to black point than most varieties and belongs to the weak flour class.

Currawa is moderately resistant to flag smut and somewhat rust-resistant. It is a very popular variety in Victoria, especially on the mallee soils; it is recommended in preference to Yandilla King for the light sandy mallee soils of New South Wales. The Department also recommends Currawa for early sowing on the North-western Slopes, but its popularity has waned slightly in recent years.

(*To be continued.*)

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36A, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Aussie	Manager, Experiment Farm, Trangie.
Baroota Wonder	Manager, Experiment Farm, Temora.
Bobin	Manager, Experiment Farm, Trangie. Manager, Experiment Farm, Condobolin. W. W. Watson, "Woodbine," Tichborne. E. J. Johnson, "Iona," Gunningbland.
Bruce	L. R. Harton, "Ferndale," Werris Creek.
Canberra	Manager, Experiment Farm, Trangie. Manager, Experiment Farm, Condobolin. Freudenstein Bros., Post Office, Tyagong. W. W. Watson, "Woodbine," Tichborne. E. J. Johnson, "Iona," Gunningbland.
Canimbla	A. E. Dixon, "Bramshott," Wallendbeen.
Clarendon	C. Anderson, Swan Vale Post Office, *via* Inverell.
Currawa	Manager, Experiment Farm, Temora.
Exquisite	P. Corcoran, "Weeroona," Moombooldool.
Federation	Manager, Experiment Farm, Temora.
Firbank	Manager, Experiment Farm, Trangie. Manager, Experiment Farm, Condobolin.
Florence	Manager, Experiment Farm, Trangie.
Gallipoli	Manager, Experiment Farm, Temora.
Gluyas Early	Manager, Experiment Farm, Temora.
Gullen	P. Corcoran, "Weeroona," Moombooldool. Manager, Experiment Farm, Temora.
Hard Federation	Manager, Experiment Farm, Trangie. L. R. Harton, "Ferndale," Werris Creek
Improved Steinwedel	Manager, Experiment Farm, Trangie.
Nabawa	Manager, Experiment Farm, Trangie. J. Ralston, "Strathmore Farm," Rand, via Albury. G. Hand, "Hill View" Narromine. A. McLeod Wilson, "Karrawingi," Gulargambone. P. Corcoran, "Weeroona," Moombooldool. Whitfield Bros., "Gamble," Binnaway. R. B. B. Gibbes, "Glenmore," Old Grenfell Rd., Forbes. Manager, Experiment Farm, Condobolin. A. D. Dunkley, "Box Lea," Brundah, Grenfell. H. J. Harvey, "Kindalin," Dubbo. G. R. Lee, "Oakwood," Dubbo.

Wheat—continued.

Nabawa	W. W. Watson, "Woodbine," Tichborne.
	J. P. Cullen, "Redbank," Dubbo.
	Quirk and Everett, "Narrawa," Wellington.
	E. J. Johnson, "Iona," Gunningbland.
Penny	Quirk and Everett, "Narrawa," Wellington.
Ranee	A. G. Manning, "Irriga," Ungarie.
Thew	L. G. Pryor, "Eriston" Gunnedah.
Turvey	W. W. Watson, "Woodbine," Tichborne.
Waratah	Manager, Experiment Farm, Trangie.
	T. W. Abberfield, "Wongo Creek," Alexander Park.
	G. Hand, "Hill View," Narromine.
	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Temora.
	S. E. Nash, "Lockwood," *via* Canowindra.
	W. W. Watson, "Woodbine," Tichborne.
	E. J. Johnson, "Iona," Gunningbland.
	A. E. Dixon, "Bramshott," Wallendbeen.
Yandilla King	Whitfield Bros., "Gamble," Binnaway.
	Manager, Experiment Farm, Temora.
	A. E. Dixon, "Bramshott," Wallendbeen.
	S. E. Nash, "Lockwood," via Canowindra.

Oats—

Algerian	Manager, Experiment Farm, Temora.
	C. Bennett, Forbes-road, Cowra.
	A. E. Dixon, "Bramshott," Wallendbeen.
Belar	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
Buddah	Manager, Experiment Farm, Trangie.
Gidgee	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
Lachlan	Manager, Experiment Farm, Temora.
	A. E. Dixon, "Bramshott," Wallendbeen.
Mulga	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
	C. Bennett, Forbes-road, Cowra.
Sunrise	Manager, Experiment Farm, Trangie.

Sorghum—

Sumac	Manager, Experiment Farm, Bathurst.
Saccaline	Manager, Experiment Farm, Grafton.
	A. S. Pankhurst, 36 William-street, Singleton.
Collier	Manager Experiment Farm, Grafton.

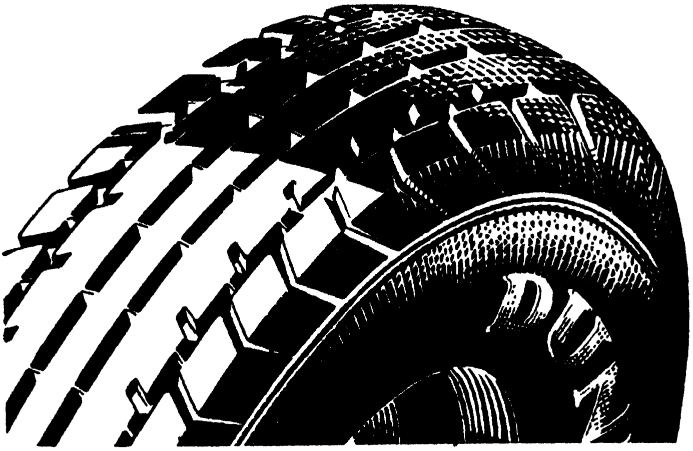
A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

INFECTIOUS DISEASES REPORTED IN DECEMBER.

THE following outbreaks of the more important infectious diseases were reported during the month of December, 1930 :—

Anthrax	**2**
Blackleg	**2**
Piroplasmosis (tick fever)	**Nil.**
Pleuro-pneumonia contagiosa	**5**
Swine fever	**Nil.**
Contagious pneumonia	**1**
Necrotic enteritis	**1**

—MAX HENRY, Chief Veterinary Surgeon.



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Wheat Crop-growing Competitions, 1930.

JUDGES' REPORTS INDICATE THE BEST PRACTICES.

Parkes and Adjacent Centres.

H. BARTLETT, H.D.A., Senior Agricultural Instructor, and A. C. ORMAN, H.D.A., Agricultural Instructor.

THE abnormal shortage in the aggregate rainfall for the two-year period April, 1928, to March, 1930, and the absence of substantial and penetrating rains during this period, were responsible for leaving the subsoil practically devoid of "carry-over moisture" for the 1930 crop. The crop growth was therefore wholly dependent on the rains which fell during the growing period.

The following table shows the rainfall at a number of centres at which competitions were held:—

RAINFALL Records, 1929–30.

	Parkes (average)	Parkes	Forbes.	Trundle.	Bogan Gate.	Condobolin.	Manildra	Tullamore.	Peak Hill.
Fallow Period.	Points.	Points.	Points.	Points.	Points.	Points.	Points.	Points.	Points.
June, 1929, to March, 1930—Total	1,787	1,188	944	858	818	935	984	1,126	1,116
Growing Period. 1930—									
April	146	102	89	54	46	111	55	29	70
May	159	136	145	91	91	87	106	87	109
June	237	295	233	270	279	391	178	327	257
July	187	219	182	136	174	106	229	143	211
August	187	214	210	263	163	127	161	262	200
September ...	170	19	22	7	13	132	37	17	11
October ...	154	379	376	334	270	204	386	355	270
Total ...	1,240	1,363	1,257	1,069	1,036	1,158	1,152	1,220	1,128
Grand Total	3,027	2,551	2,201	2,013	1,854	2,093	2,136	2,346	2,244

Good general rains were recorded in August and December, 1929, but during the other months of the fallow period, hardly sufficient rain fell to justify the working of the fallows. The light showers during the three months January to March, 1930, were of little benefit, with the result that in most cases the seed-bed lacked the desirable finish at sowing time. Very favourable weather conditions were experienced from April to August, and so promising were the prospects that record yields were anticipated.

These bright hopes were somewhat dispelled by the critical month of September being abnormally dry, and when appreciable rain did fall in

October, the expected crop "comeback" was rather disappointing. The days prior to the October rains were warm to hot, and somewhat windy, and these conditions had a marked detrimental effect on the crops. Early crops which were in ear at the end of September generally held their condition well, and the rains practically assured a satisfactory filling. The period of dry weather which prevailed in September caused the bulky, soft crops to be retarded in development, and the appearance in many crops of wilted and brown patches.

Following the general October rains, rust made its appearance in many localities, the degree of development varying in different districts. The forward nature of the crops at the period of infection, however, precluded any appreciable damage being done. Frost attack was noticeable in some instances, the damage being more severe where the varieties were sown out of season.

The Number of Entries.

Twelve associations (a record number) promoted wheat-growing competitions during the past season, while the entries totalled ninety-three. The details are as follows:—

Association.	No. of Entries	Association.	No. of Entries
Forbes P.A. & H. Association	16	Manildra P.A. & H. Association	6
Parkes ,, ,,	4	Coradgery Agricultural Bureau	7
Trundle ,, ,,	7	Gunning Gap ,, ...	5
Peak Hill ,, ,,	8	Dunmore ,, ...	6
Bogan Gate ,, ,,	12	Ootha ,, ...	7
Tullamore ,, ,,	9		
Condobolin ,, ,,	6	Total Entries	93

The Quantity of Superphosphate Used.

With one exception, and that a crop on new land, all 1930 entries were fertilised with superphosphate. In every instance the average quantity used for each centre showed a decrease on the average quantities applied in 1929. The reasons given for this are:—(1) In many cases owing to the crops failing entirely in 1929, the soil was not impoverished of its plant-food to the same extent, consequently smaller applications of fertilisers were justified; the farmers also no doubt took into consideration the residual value of the superphosphate applied the previous year; (2) the necessity, in some cases, for lessened expenditure during hard times.

The average quantities used in 1930 were:—Forbes 54 lb., Parkes, 58 lb., Trundle 53 lb., Peak Hill 51 lb., Bogan Gate 55 lb., Tullamore 56 lb., Condobolin 46 lb:, Manildra 68 lb., Coradgery 45 lb., Gunning Gap 54 lb., Dunmore 41 lb., and Ootha 43 lb.

Seeding.

The average quantity of seed applied in several competitions was slightly less than for last year, which was due mainly to the relative early sowing of most crops in the west this year. Cash considerations also may have influenced farmers to reduce their rate of seeding.

The average amounts used per acre in 1930 were:—Forbes 62 lb., Parkes 61 lb., Trundle 47 lb., Peak Hill 55 lb., Bogan Gate 59 lb., Tullamore 55 lb., Condobolin 49 lb., Manildra 67 lb., Coradgery 53 lb., Gunning Gap 54 lb., Dunmore 49 lb., Ootha, 48 lb.

Of the ninety-three crops inspected, eighty-nine treated with dry copper carbonate power, and three with bluestone solution, while only one was untreated. No trace of bunt infection was detected in any of the crops.

Varieties Used.

The marked increase in popularity and the general success of Nabawa variety were features of the competitions. A perusal of the table given below indicates that this variety constituted 26.9 per cent. of the entries and scored 38.2 per cent. of the points—slightly more than the popular and well-tested variety Waratah. Waratah and Turvey were next best in that order. The outstanding success of Nabawa and Waratah can be attributed, to a certain extent, to the fact that these two varieties were less affected by the vagaries of the season than most other varieties.

Waratah with 36.6 per cent. of the entries was again the most popular variety exhibited, and Nabawa appears to be the only variety likely to replace it.

The varieties used and their placing in the twelve competitions were as under:—

VARIETIES USED.

Variety.	Percentage of Times Entered.	No. of Times Entered.	Number of Placings.			Points.*	Percentage of Points.
			1st.	2nd.	3rd.		
Nabawa	25	26·9	5½	3½	4	27½	38·2
Waratah	34	36·6	3½	7	3½	26	36·1
Turvey	5½	5·9	1½	1½	...	7½	10·4
Canberra	8⅓	8·9	...	1	1⅓	3⅓	4·6
Sultan	1	1·1	1	...	...	3	4·2
Federation	5½	5·9	½	...	...	1½	2·1
Rajah	2	2·1	...	...	1	1	1·4
Yandilla King ...	3	3·2	...	...	1	1	1·4
Bena	1½	·5	...	...	½	½	·7
Bobin	1⅓	1·1	...	...	⅓	⅓	·5
Bogan	1⅓	1·1	...	...	⅓	⅓	5

* The points are calculated in the proportion of 3 for first place, 2 for second, and 1 for third. The maximum number of points for the 12 competitions would thus be 72.

Cultural Methods.

Of the competition crops eighty-four were grown on fallowed land, and nine on stubble. The majority of the winning crops were grown on land fallowed in either August or September.

The number of times the fallows were worked was slightly less for 1930 than 1929. This fact is due chiefly to the spasmodic nature of the rains received during the fallow period—in two months only (August and December) were the rains sufficient to justify working the fallows. Owing to the shortage of feed during the fallow period, sheep were mostly used to clean the fallows wherever necessary.

Again, many of the failed areas of 1929 required very little cultivation to prepare them satisfactorily for sowing in 1930. Of the implements used to give the land the initial working, the plough (both mouldboard and disc), and sundercut were the most popular, while the combine and scarifier found favour to a certain degree. The disc cultivator was used on three occasions.

The fallows were cultivated mostly with springtooth implements and combines. Nine of the competition crops were sown with the seed drill, and the remaining eight-four with the combine.

In the following table is shown the number of crops grown on fallowed and stubble land in each competition, and also the average number of times the fallow was worked in each locality.

FALLOWING Details.

Locality.	Number of Crops Exhibited.	Number of Crops on Fallow.	Number of Crops on Stubble.	Average Number of Times Fallow Worked.*
Forbes	16	16	...	3·0
Parkes	4	4	...	5·0
Trundle	7	6	1	3·2
Peak Hill	8	4	4	3·2
Bogan Gate	12	12	...	3·5
Tullamore	9	7	2	3·0
Condobolin	6	6	...	3·3
Manildra	6	6	...	3·0
Coradgery	7	7	...	3·0
Gunning Gap	5	5	...	3·0
Dunmore	6	6	...	2·6
Ootha	7	5	2	2·6

* The ploughing or initial working of the ground, and the sowing, if done with a seed drill, have not been included in the number of workings. Where the combined drill was used it has been counted as a working.

Diseases.

The disease which caused the farmer the greatest concern was undoubtedly rust. Generally speaking, however, the damage done was not excessive, though in the western portions of the district, such as Tullamore, where the degree of infection was the most marked, individual crops suffered severely. In a few cases the quality of the grain was reduced, and a uniform sample was not harvested. Many crops, though infected with rust, did not suffer at all, owing to the fact that they were too far advanced at the period of infection. Observation indicates that the most susceptible period of infection is when the grain is in the milk condition. The varieties that showed the most resistance to the disease were Nabawa and Waratah, while Federation was very susceptible.

Light to medium infections of flag smut came under notice; Nabawa again proved to be free from the disease. Isolated heavy infections of foot-rot and take-all were observed; these mostly occurred in the variety Turvey. Bunt was entirely absent from all crops, while loose smut was observed only as a light to medium infection.

September frosts were responsible for damage being done to some crops at the flowering stage—generally the result of sowing varieties out of season, that is, too early. Where early sowing is to be adopted, it is wise to sow late-maturing varieties, *e.g.*, Yandilla King and Turvey.

Most of the crops inspected were subject to the attack of wheat leaf blight (*Septoria*), but the disease did not have any detrimental effect on forward crops, such as those judged in the competition. The later crops, however, which were still in the milk condition about mid-November suffered rather severely, the climatic conditions (cool and moist) experienced during this month, being such as to accentuate the trouble and increase the severity of the attack. The disease in conjunction with flag and stem troubles (rust and dry weather) had the effect of killing the flag entirely (and in some cases attacking the stem), thus checking the food supply considerably and finally causing crops to fail in some cases and to yield pinched grain in others.

Weeds.

Very few crops were entirely free from weeds—black oats, wild mustard, saffron and variegated thistles constituting the bulk of the offenders. The lack of beneficial fallow rains during the past two years restricted the working of the fallows to a minimum in many instances, with the result that the majority of the black oats and other weed seeds remained dormant in the soil until April or May, when the favourable conditions which prevailed caused them to germinate with the wheat.

South-western District.

D. V. DUNLOP, H.D.A., Agricultural Instructor.

In the south-western district wheat crop-growing competitions were conducted by the Ungarie, Tullibigeal, and Thuddungra branches of the Agricultural Bureau, and the West Wyalong, Barellan, Ardlethan, Ariah Park, Cootamundra, Murrumburrah, Boorowa, and Young agricultural societies. The Ungarie and Tullibigeal competitions were judged by Mr. R. N. Medley, Agricultural Instructor.

The Season.

Over such a large area as that covered by these competitions the season was variable. Fallowing was carried out under difficulties at all centres; the winter of 1929 was dry, and most farmers had to wait until August to plough their fallow. Comparatively little rain fell during the summer and autumn months and cultivations were reduced to a minimum as a consequence. Fortunately good rains fell towards the end of April and during May, and germination was generally very good. In the western and Riverina sections many crops were sown dry on account of the lateness of the rain, and germination in a few cases was patchy, due in some instances to light showers sending the grain mouldy, but generally the fault lay with the farmer neglecting to use the harrows as soon as possible after the rain came. Generally speaking, where wheat is sown dry the farmer must be prepared to harrow as soon as possible after rain in order to break up any crust that may form and allow the young plants to get through the ground.

Although no soaking rains were experienced, frequent falls kept the crops making splendid headway during the winter months. Unfortunately late August and September were extremely dry and crops were very seriously checked in the western and Riverina sections, many burning off badly. On account of early heavy growth and lack of subsoil moisture crops on heavier ground as a rule suffered most. The damage was not nearly so serious on the southern slopes where crops hardly suffered. Bountiful rains came in October, and, although too late for many crops in the earlier sections, the majority responded sufficiently to be saved from complete failure. A great deal of second growth occurred, particularly in the west. However, the majority of the competition crops stood the dry period fairly well and yielded a good sample of grain. It was noticeable that crops on fallow stood the dry time better and responded quicker after the October rain than did stubble crops.

Due to changeable windy weather and frequent showers late in the season many crops on the slopes, where the growth had been rather rank, went down, and rust made its appearance, although it did not develop very seriously except in a few cases. In addition a number of crops, particularly the later-maturing varieties, were "blighted" or "hayed off," due entirely to the changeable and unfavourable ripening weather following the abnormally heavy rains of October. A certain amount of pinched grain was the result.

RAINFALL on Fallow and Growing Crops.

Period	West Wyalong.	Ungarie.	Tullibigeal	Ardlethan.	Ariah Park.	Cootamundra.	Young.	Boorowa.	Murrumburrah
	points.	points.	points.	points.	points.	points.	points.	points.	points.
Fallow Period... ...	838	933	860	...	932	1,434	1,188	...	1,206
Growing Period—									
April, 1930 ..	90	90	86	56	83	116	...	145	Details not available.
May „ ...	128	122	134	87	113	152	152	118	
June „ ...	115	127	153	178	145	184	178	157	
July „ ...	98	121	116	126	141	153	243	201	
August „ ...	167	132	101	179	245	290	164	296	
September „ ...	15	20	10	56	52	15	99	123	
October „ ...	299	315	333	286	333	250	481	469	
Total ...	912	927	933	968	1,112	1,160	1,317	1,509	1,336

Varieties.

In all 183 entries were inspected, and these included 30 varieties. Nabawa was easily the most popular wheat with a total of 63½ entries, followed by Yandilla King with 40, while only Waratah, Marshall's No. 3, and Penny of the remainder ran into double figures. These varieties filled practically all the places in the competitions.

It is obvious that too many varieties are being grown, and farmers would be well advised to concentrate on the varieties recommended by the Department for their district.

Nabawa has again proved its suitability for the earlier districts, and is becoming increasingly popular, mainly at the expense of Waratah, on account of its resistance to flag smut and ability to withstand a dry time. It is interesting to note that of the 17 entries judged at Tullibigeal no less than 12½ were Nabawa. At Ungarie 16½ crops of Nabawa were included in the 32 entries.

Yandilla King retains its well deserved popularity and is undoubtedly the best all-round late-maturing wheat. To give of its best, however, it should be sown early on well-prepared fallow. Marshall's No. 3 is popular on the slopes, where it does well with the higher rainfall. Penny is doing well on many of the mallee soils.

The following table shows the number of placed entries of each variety and the awards gained:—

VARIETIES Entered.

Variety.	No. of Times Entered.	Placings.			
		First.	Second.	Third.	Total.
Nabawa	63½	5	4	4½	13½
Yandilla King	40	4	4	4	12
Waratah	17½	3½	2	3	8½
Penny	12	1½	1	2	4½
Marshall's No. 3	11½	2	0	1½	3½
Turvey	9½	0	3	0	3
Federation	6	1	1	0	2
Union	2	...	...	½	½
Queen Fan	1½	½	1	...	1½
Ranee	1½	1½	...	...	1½
Gresley	½	...	...	½	½

Bena, Bobin, Wandilla, Joffre, Gullen, Gallipoli, Ford, Baringa, Baroota Wonder, Quality, Duchess, Teagle, Baldmin, Gluyas, Aussie, Caliph, Jay Wonder, and German Wonder were also entered, but did not gain places.

Purity and Cleanliness.

The majority of crops were not as pure and as true to type as could be desired. Most of the leading crops were quite satisfactory, but there is still too much mixed seed used. I would again strongly urge farmers to obtain two or three bags of seed from a reliable source and from the small area thus sown produce their own pure seed.

Crops were generally free from undergrowth, but black oats were more numerous in many cases than usual, due mainly to the fallowing period being too dry for them to germinate and thus allow of their being destroyed. The result was that they came up with the wheat.

Disease was not greatly in evidence. Flag smut was present in all varieties except Nabawa, but it was only serious in some of the western crops. Rust was found in practically all crops, particularly on the slopes. Fortunately, however, only in a few cases had it developed sufficiently to damage the grain. Only two crops were found to be bunt infected, due to faulty pickling. With modern methods of dry pickling there is no excuse for this disease. A little foot-rot was noted, particularly on the slopes.

Cultivations.

All entries were on fallow except nine at Cootamundra, two at Boorowa, and one at Wyalong. On the slopes many stubble crops compared more than favourably with the average ones on fallow. This is due to the dry fallowing period and the frequent good rains during the growth of the crops, particularly the October rains, which caught these crops at the stage when they derived the greatest benefit. However, even in these favoured areas fallowing is essential for good crops in average years, and farmers must remember that wet growing periods such as we have just had, and, particularly, good October rains are rather rare.

The average number of times the fallows were worked was three, excluding ploughing and sowing, the latter being mostly done with a combine. In view of the limited rainfall, this is a very satisfactory average, farmers wisely refrained from dry workings, and sheep were used extensively to keep down what little weed growth there was. Practically all fallows received the essential summer cultivation following the rains before harvest. All winning crops except second and third at Cootamundra were on long fallow.

Rate of Seeding and Fertilising.

The following table shows the average rate of seeding and the average amount of superphosphate applied per acre:—

	Average Amount of Seed per Acre.	Average Amount of Superphosphate per acre.
	lb.	lb.
Tullibigeal	55	54
Ungarie	55	63
West Wyllong	59	64
Barellan	61	75
Ardlethan	61	71
Ariah Park	60	80
Cootamundra	66	65
Murrumburrah	62	67
Young	62	74
Thuddungra	62	58
Boorowa	62	74

The rate of seeding taken right through is satisfactory, and is governed by the variety, time of sowing, condition of fallow, and district. As a general rule, light to medium sowings are most satisfactory for the drier districts, and the heavier rates (above 60 lb.) should be reserved for the wetter districts, except sometimes in the case of early varieties sown very late.

The amount of superphosphate could be considerably increased with advantage, particularly on the slopes. While the most economical rate is a matter for individual experiment, an average of at least 84 lb. per acre will be found profitable.

The Central-western District.

W. D. KERLE, H.D.A., **Senior Agricultural Instructor.**

The following associations conducted competitions in the Central-western district:—Grenfell P.A. and H. Association, Ooma and Tyagong branches of the Agricultural Bureau, and the P. and A. Associations at Cowra, Canowindra, Molong, and Cudal. The total entries numbered 126.

The Molong and Cudal competitions were judged by Mr. G. Nicholson, Agricultural Instructor, Dunedoo, and the Tyagong competition by Mr. Taylor, Experimentalist, Temora Experiment Farm.

The Season.

The season generally was favourable, but the rainfall which it was reasonable to expect following two extremely dry seasons, was not experienced. The rains at seeding time and during the first two months of growth were excellent, but a variety of adverse conditions were experienced and yields were considerably below early anticipations.

The droughty conditions of 1929 practically extended until November, when excellent falls of from 2½ to 3 inches were recorded, followed by heavier falls in December. It was, therefore, difficult to commence the fallow ploughing early, but during August most of the ground in these competitions was ploughed and brought into good condition by after-harvest working, chiefly following the late December rain. January, February, and March saw a return to droughty conditions. Very little rain fell, Grenfell, for example, recording only 60 points for the three months. As what little weed growth was present was easily kept down by sheep, fallow working during these months was unnecessary. The dry conditions lasted until the end of the third week in April, when excellent rain fell, being followed by further falls early in May. Excellent conditions followed for the sowing period, which extended to the end of June, a record area being sown.

Winter rains were not heavy but quite sufficient to maintain growth and promote free stooling. Heavy rain during this period would have been appreciated to replenish the subsoil moisture which was very low. This deficiency became very apparent in September, which was very dry, and, as there was no reserve moisture to call upon, the wheat began to burn off. Fortunately, rain fell in time to save all but very early crops on strong ground, which made a partial recovery only. The "finishing" rains were ample, and a good sample of grain seemed assured when strong cold winds were experienced on 12th to 14th November and hastened the maturation period, causing a very serious "haying in" of late crops in the later districts and a fair percentage of pinched grain. In nearly every section of the district lodging was in evidence, but the reduction in yield or quality of grain from this cause was not great.

RAINFALL at Various Centres.

Month.	Canowindra.	Grenfell.	Cowra.	Cudal.	Molong.	Tyagong.
Total on fallow (August, 1929, to March, 1930)	points. 1,180	points. 1,095	points. 942	points. 1.231	points. 1,446	points. 1,016
Growing Period, 1930—						
April	80	156	116	78	91	115
May	166	167	116	151	168	93
June	190	155	172	169	251	181
July	225	225	187	242	310	237
August	245	267	184	269	311	236
September	55	145	24	37	47	110
October	396	436	391	451	490	435
Total for growing period	1,357	1,551	1,190	1,397	1,668	1,407

The Most Popular Varieties.

The number of different varieties entered was approximately the same as in previous years.

The following table indicates the popularity of varieties and their success in these competitions:—

Varieties.	Total entries.	Number of times placed.			Percentage of Placings	Order of Popularity. (percentage of Total Entries.)
		First.	Second.	Third.		
Waratah	36½	3	½	2	25·0	31·0
Yandilla King	21	3	3	2	35·4	17·8
Turvey	17	1	1	1	12·5	14·4
Nabawa	13	...	1½	1	8·3	11·0
Marshall's No. 3 ...	8⅓	1	1	1	12·5	7·0
Canberra	5	...	...	...	...	4·0
Bena	3⅓	...	...	...	...	2·8
Penny	2⅓	...	...	...	...	2·0
College Purple Straw ...	2	...	...	...	...	1·7
Duchess	2	...	...	...	...	1·7
Currawa	2	...	...	...	...	1·7
Bobin	1⅓	...	...	1	2·1	1·2
Canimbla	1	...	1	...	4·2	·9
Numba	1	...	...	...	...	·9
Union	1	...	...	...	...	·9
Exquisite	½	...	...	...	...	·4
Nizam	⅓	...	...	...	...	·3
Hard Federation ...	⅓	...	...	...	...	·3

The table shows Waratah still to be the most popular variety in the central-west. Compared with last year it has decreased in popularity 2 per cent., while Yandilla King has advanced nearly 3 per cent., Turvey 5½ per cent., and Nabawa 5 per cent. However, in assessing the value of the "placings," Yandilla King gave by far the best results, with Waratah a good second, Turvey and Marshall's No. 3 third, and Nabawa fourth.

The success of Yandilla King, Turvey, and Marshall's No. 3 is largely due to the season favouring the late-maturing varieties, which got the full benefit of the October rainfall. On the other hand, they had to contend with rust, a late development of foot-rot, and wind damage. The success of Nabawa and Waratah was largely due to their rust-escaping characters.

Rust was the Worst Disease.

Although not prevalent to a marked degree, rust was the worst disease this season, causing grain to pinch badly in some sections. Fortunately the most popular varieties in the district are either more or less rust-resistant, or, as in the case of Waratah, they have the capacity for maturing a fairly plump sample of grain, although apparently badly affected by rust.

The first disease was noticed during August and September, when leaf-spot made its appearance and considerably thinned the crops in some sections. Although most resistant to other diseases, Nabawa appeared to be badly affected by this disease, much of the thinning thought to be due to the dry weather in September being caused by leaf-spot.

Flag smut was not as prevalent as last year, the crops generally being fairly free. Foot-rot developed very late, and in a serious form, particularly in Turvey and Yandilla King in the late districts.

The average points awarded in each competition under the heading "Freedom from Disease" were:—Grenfell 28.2, Cowra 27.0, Molong 25.0, Cudal 26.2, Tyagong 26.5, Ooma 26.1, and Canowindra 26.7.

Trueness to Type and Purity.

The average points awarded each association under this heading were Grenfell 18.4, Cowra 19.0, Molong 18.2, Cudal 17.5, Canowindra 17.9, Tyagong 17.6, and Ooma 17.9. The averages of Grenfell, where there were twenty-eight entries, and at Cowra, with twenty-two entries, are particularly good, and the standard throughout must be considered as very favourable.

Amounts of Seed and Fertiliser Used.

The following table shows the amounts of seed and superphosphate per acre used in each competition:—

	Grenfell.	Cowra.	Canowindra.	Ooma.	Tyagong.	Cudal.	Molong.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Seed per acre	60·0	59·0	56·7	59·1	63·2	60·0	58·2
Superphosphate per acre ...	62·54	62·6	58·2	63·5	63·20	62·3	61·0

The rate of seeding was lower than usual, but as conditions were very favourable for the greater part of the sowing period it was wise to economise in seed. The amount of superphosphate used was also less than in previous years, it being reasoned by farmers that the fertiliser applied during the preceding droughty years would have some residual effect. It is false economy, however, to use less than 65 to 75 lb. superphosphate per acre on the light to medium loams, which constitute the bulk of the wheat soils in this district.

Fallow Workings.

The number of cultivations of the fallow was similar to the previous year and averaged from 3 to 5. The dry summer months rendered fallow working unnecessary. The condition of a fallow and its ability to absorb and retain moisture are not dependent so much on the number of workings as on the time and the thoroughness with which they are done. The essential operations are the quick restoration of a cloddy mulch after rain and the killing of weed growth in its very early stages.

Yields.

Excellent yields were recorded this season, the averages in the various competitions being:—Grenfell 28.3 bushels, Cowra (open competition) 31.5 bushels, Cowra (640-acre competition) 29.6 bushels, Canowindra 31.3 bushels, Molong 33.5 bushels, Cudal 29.3 bushels, Ooma Agricultural Bureau 27.8 bushels, and Tyagong Agricultural Bureau 24.6 bushels.

The average yield of the first three placed blocks in eight competitions was 33 bushels, and of the last three 25.3 bushels, the average for the whole of the district competitions being 29.4 bushels.

The North-western District.

J. A. O'REILLY, H.D.A., Agricultural Instructor.

The crop competitions in that section of the north-west from Inverell to Curlewis, and including Bingara, Pallamallawa, Wee Waa, and Tambar Springs, were an unparalleled success. Competitions were conducted by agricultural societies at Gunnedah, Narrabri, Wee Waa, Moree, Bingara, and Inverell, and by Agricultural Bureau branches at Boggabri and Delungra.

At Narrabri a competition was conducted for an area of 200 acres produced entirely by tractors.

An Unusual Season.

Conditions throughout the fallowing period and up till harvest time were most unusual for the north-west. The winter was in direct contrast with that of 1929. Over most of the district during that period the rainfall was scanty and frosts frequent and severe, whilst during the same period of this year the rains were copious combined with exceedingly mild conditions.

The December-January period was similar to that of the previous year in that it was comparatively dry, whereas normally in the north-west this is

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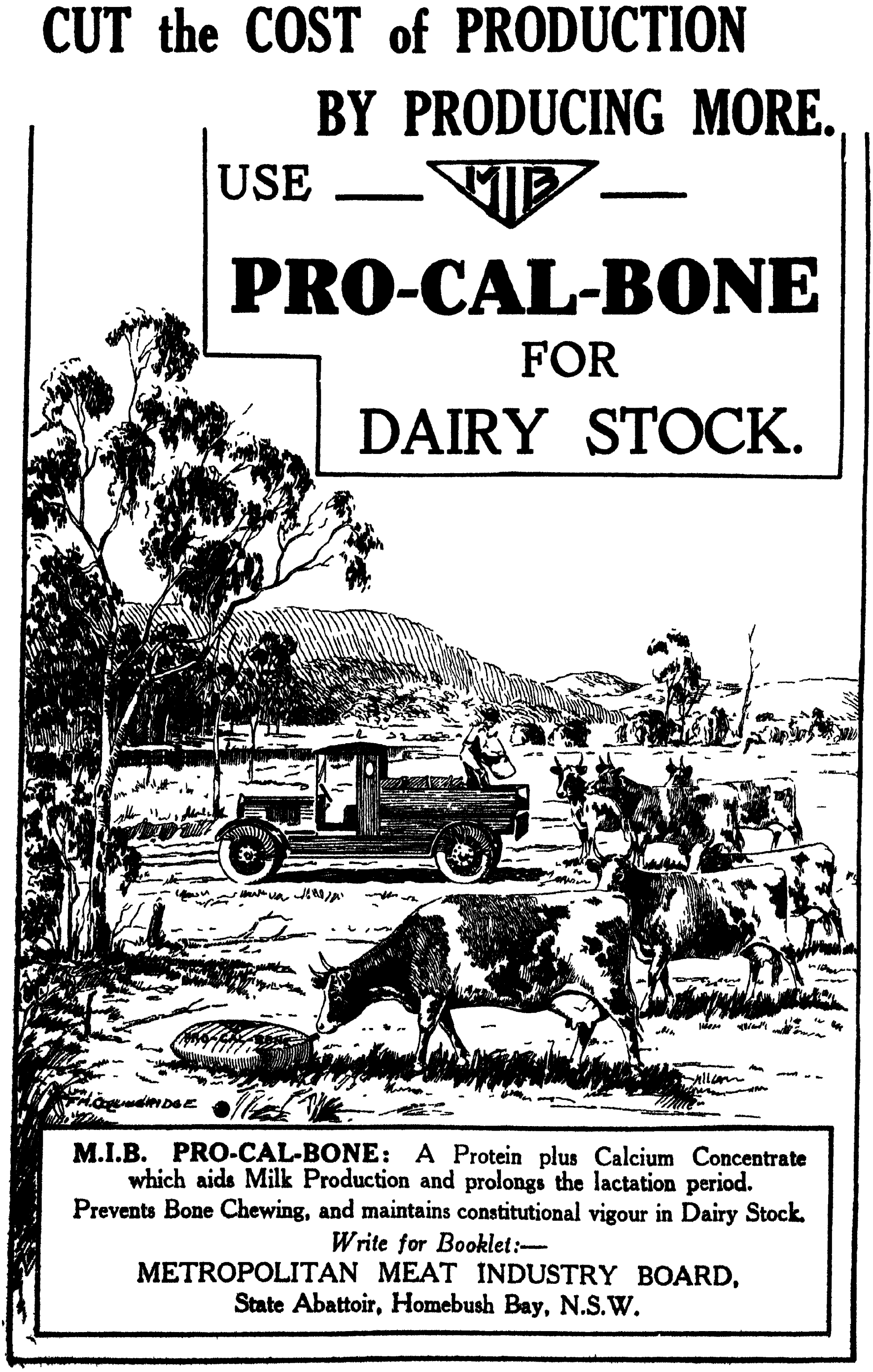

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a period of rather heavy rainfall. Good rains, however, were experienced over most of the district at the end of January, and this enabled farmers to proceed with work on the stubble paddocks and to give the winter fallows a further working. The country lying on the eastern and northern side of the Namoi River did not receive as heavy falls as the country on the opposite side, and it was not till the advent of general rain at the end of May and during June that any appreciable growth was made in that section. Rains during April were generally sufficient to germinate April- and early May-sown crops, but later May sowings did not completely germinate till after the rains of late May and June. Weed growth on the fallows was not excessive, and was dealt with by the sheep. After the initial January-February working the fallows were again worked in March, April and May. Except for a sprinkling of wild mustard the crops were free of weed growth in the earlier section of the district, but at Inverell the black oat proved troublesome during the fallowing period and in the crops.

The mild conditions during the winter induced a rapid, soft, succulent growth, and it was not until well into July that the crops were checked by frosts. By this time many crops had become spindly, and the head was well up the sheath. Despite the fact that the soil was well supplied with moisture many frost-damaged heads were noticeable when the crop eventually came into ear. Frosts at a later stage were responsible for the imperfect filling of the ears.

The soft, succulent nature of the crops and subsequent muggy conditions were factors which favoured the development of rust in the crops. The conditions following October rains were certainly suitable for rust development; but in many instances severe damage was done by the disease prior to these rains. Apart from this damage, the crops in the earlier section of the district produced a good sample of grain. At Inverell notwithstanding the comparative freedom from rust at the time of judging, the crops were in a more susceptible condition than those in the earlier section of the district.

RAINFALL at the Different Centres.

1930.	Turrawan.	Narrabri P.O.	Pallamallawa.	Wee Waa P.O.	Bingara.	Inverell.	Inverell P.O.	Mary's Mount.	Trelor Springs.	Boggabri.	Gunnedah P.O.	Kelvin P.O.
	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.
Fallow period (Jan. to March)	544	541	561	578	990	1,025	1,036	531	577	446	408	405
Growing period												
April ...	157	184	36	138	211	160	63	138	87	156	142	140
May... ...	137	45	46	35	76	160	102	48	110	69	63	55
June ...	296	400	388	250	419	420	431	485	481	407	613	373
July ...	122	218	189	206	203	195	257	106	164	158	143	124
August ...	149	98	145	114	157	216	255	24	87	115	53	28
September ...	92	101	85	52	140	...	93	73	85	61	81	92
October ...	223	289	337	204	345	385	357	340	430	265	334	391
Total, Growing period	1,176	1,335	1,226	999	1,551	1,536	1,558	1,214	1,444	1,226	1,429	1,203
Grand Total ...	1,720	1,876	1,787	1,572	2,541	2,561	2,594	1,745	2,021	1,672	1,837	1,408

Cultural Details.

Of the 123 crops exhibited this season 16.3 per cent. were grown on winter fallow as against 7.3 per cent. last year. This difference is evidence of the fact that the farmers of the north-west, whilst realising that it is not essential to fallow their land each year, are endeavouring to arrange their cropping so that a certain area of the crop will be sown on winter fallow each year. The practice of winter fallowing combined with a systematic crop rotation is a factor in controlling fungous diseases and weeds and also in increasing and maintaining yields throughout the district.

The average number of times the fallows were worked was as follows:—Gunnedah 2.6, Boggabri 2.4, Narrabri 2.4, Wee Waa 2.3, Moree 2.8, Delungra 1.2, Bingara 1.4, and Inverell 3.3 times.

Seed and Fertiliser.

The average rates of seeding at the various centres were as follows:—Gunnedah 45.7 lb., Boggabri 48.8 lb., Narrabri 48.5 lb., Wee Waa 48.1 lb., Moree 49.1 lb., Delungra 45 lb., Bingara 46 lb., and Inverell 54.5 lb. per acre. The lowest rate of seeding used was 32 lb. and the highest was 60 lb. per acre. The average rate throughout the district was 48.2 lb. per acre.

That the use of superphosphate is not an important factor in the production of wheat in the north-west is evidenced by the fact that of the 123 crops exhibited only two were treated (with 50 lb. of superphosphate) at Narrabri and one (with 50 lb.) at Wee Waa, and half an entry (with 40 lb.) also at Wee Waa. The soils generally in the district are well supplied with mineral plant food; but by consistent cropping the amount of available plant food is being depleted, and the soil requires an occasional spell to allow of a further supply of available plant food being accumulated for subsequent crops.

Varieties of Wheat Used.

The season proved a most interesting one from the point of view of varieties. The selection of suitable varieties is still an important factor and, coupled with improved cultural methods, is responsible for the advances already made in the wheat-growing industry in the north-west. The comparative new varieties, such as Ford, Nabawa, Aussie, and Waratah triumphed over the rust menace, whilst Clarendon also resisted the disease.

Nabawa was entered twenty times and secured three and a half first places, whilst Ford was entered six times and secured two first places. In the north-western championship Ford was placed first and second and Nabawa third and fourth.

Hard Federation, Wandilla, Duri, Bobin, Currawa, Pusa No. 4, Early Bird, Viking, Gresley, Riverina, Marquis, Cadia, and Quality were entered, but failed to gain any places.

VARIETIES Used and Their Placings.

Variety.	Number of Entries.	Placings.			
		First.	Second.	Third.	Total.
Nabawa	21	3½	3½	1	8
Ford	6	2	...	1	3
Waratah	38	1½	1	3½	6
Aussie	3⅚	1	1	...	2
Canberra	10½	...	2	...	2
Queen Fan	4½	...	½	1	1½
Cleveland	7	...	...	1	1
Clarendon	2½	...	...	½	½

Diseases.

The most prevalent disease this year was rust; the occurrence was general, but the extent of the damage was variable.

Although in isolated cases throughout the district, flag smut was responsible for extensive reductions in yield of some of the susceptible varieties, it can be said that the effect of this disease in the competition crops was negligible. It is possible that conditions were suitable for the germination of the spores in the autumn and the better consolidation of the seed bed minimised the ravages of this disease.

Bunt was prevalent in some crops in one competition, but this was positively due to inefficient treatment.

The damage caused by foot-rot was fairly considerable in some of the crops in the Inverell competition, although it was not noticeable to any great extent in the crops in the earlier section in the district.

General Remarks.

Although the number of crops grown on winter fallow this season showed an increase over last year, the major portion of the wheat produced in the north-west is grown on short summer fallow. This short fallow period for the past two years has been of such a nature that the number of workings has been reduced to a minimum.

The results of the competitions during the past three seasons indicate that payable crops can be grown on well-prepared short summer fallows, using a comparatively low rate of seeding (49.5 lb. per acre being the average for the past three years) and without the use of superphosphate.

At the present time when the reduction in the cost of production is of vital importance, the farmers in the north-west are probably in a bettor position economically than those in any part of the wheat belt of New South Wales.

The daily alteration of temperature between night and day is capable of effecting the disintegration of the hardest rocks.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Lunacy Department, Morisset Mental Hospital	24	7 Jan., 1931
C. J. Parbery, Allawah, Bega	88	7 „ 1931
Kinross Bros., Minnamurra, Inverell (Geurnseys)	72	11 „ 1931
Lunacy Department, Parramatta Mental Hospital	89	28 „ 1931
W. M. McLean, Five Islands Rd., Unanderra	73	30 „ 1931
Miss Brennan, Arrankamp, Bowral	10	19 Feb., 1931
Department of Education, Yanco Agricultural High School	33	21 „ 1931
G. A. Parish, Jerseyland, Berry	103	27 „ 1931
Lunacy Department, Kenmore Mental Mospital	76	28 „ 1931
Hawkesbury Agricultural College (Jerseys)	160	1 Mar., 1931
St. Joseph's Girls' Orphanage, Kenmore	10	3 „ 1931
St. Michael's Novitiate, Goulburn	5	3 „ 1931
Kyong School, Moss Vale	3	4 „ 1931
St. Joseph's Convent, Reynold-street, Goulburn	4	4 „ 1931
St. John's Boys Orphanage, Goulburn	7	5 „ 1931
Marion Hill Convent of Mercy, Goulburn	10	6 „ 1931
Cowra Experiment Farm	29	6 „ 1931
Riverina Welfare Farm, Yanco	69	6 „ 1931
James Wilkins, Jerseyville, Muswellbrook	51	12 „ 1931
Tudor House School, Moss Vale	8	21 „ 1931
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	202	3 April, 1931
Grafton Experiment Farm (Ayrshires)	180	5 „ 1931
Department of Education, Hurlstone Agricultural High School	45	10 „ 1931
Navua Ltd., Grose Wold, via Richmond (Jerseys)	13	29 „ 1931
Australian Missionary College, Cooranbong	45	30 „ 1931
J. P. McQuillan, Bethungra Hotel, Bethungra	6	1 May, 1931
George Rose, Aylmerton	4	28 „ 1931
William Thompson, Masonic School, Baulkham Hills	48	28 „ 1931
Department of Education, Gosford Farm Homes	30	3 June, 1931
F. C. Kershaw, Macquarie House, Macquarie Fields	71	5 „ 1931
P. Ubrihien, Corridgeree, Bega	114	6 „ 1931
Gladesville Mental Hospital	42	25 „ 1931
A. L. Logue, Thornbro, Muswellbrook	40	23 July, 1931
A. H. Webb, Quarry-road, Ryde	6	26 „ 1931
A. Shaw, Barrington (Milking Shorthorns)	122	9 Aug., 1931
E. P. Perry, Nundorah, Parkville (Geurnseys)	22	13 „ 1931
Wagga Experiment Farm (Jerseys)	55	14 „ 1931
Sacred Heart Convent, Bowral	12	20 „ 1931
St. Patrick's College, Goulburn	8	22 „ 1931
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	46	22 „ 1931
James McCormack, Tumut	111	29 „ 1931
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	81	12 Sept., 1931
J. F. Dowe, "Woolomol," Tamworth	48	19 „ 1931
S. L. Wills, Greendale Dairy, Cowra	37	19 „ 1931
Wolaroi College, Orange	10	4 Oct., 1931
Riverstone Meat Co., Riverstone Meat Works, Riverstone	104	11 „ 1931
E. S. Cameron, Big Plain, Narrandera	28	14 „ 1931
J. L. W. Barton, Wallerawang	17	17 „ 1931
J. F. Chaffey, Glen Innes (Ayrshires)	75	17 „ 1931
Newington State Hospital and Home	108	24 „ 1931
Lunacy Department, Callan Park Mental Hospital	29	13 Nov., 1931
J. Davies, Puen Buen, Scone (Jerseys)	85	14 „ 1931
Wollongbar Experiment Farm, Lismore (Guernseys)	129	21 „ 1931
Tamworth District Hospital	7	24 „ 1931
Department of Education, Brush Farm, Eastwood	6	9 Dec., 1931
Bathurst Experiment Farm (Jerseys)	21	16 „ 1931
H. A. Corderoy, Wyuna Park, Comboyne (Geurnseys)	59	8 Jan., 1932
New England Girls' Grammar School, Armidale	29	10 „ 1932
New England Experiment Farm, Glen Innes (Ayrshires)	37	12 „ 1932

—MAX HENRY, Chief Veterinary Surgeon.

The presence of humus in the soil tends to improve its texture, lightening and loosening it, and preventing compaction of the surface, so that it is of special value in the amelioration of stiff soils.

Better Seed Potatoes.

A WORKABLE SCHEME FOR SECURING GUARANTEED SEED.

A. J. PINN, H.D.A., Special Agricultural Instructor.

DURING an inspection of the spring-grown potato crops in coastal areas it was evident that there would be many crop failures, even under the best of conditions as to weather and soil. The failure of many of these areas was due almost entirely to the use of virus-infected seed.

In past years much publicity has been given through the press by departmental officers to the need for potato seed improvement, and the methods to be adopted by growers in the main-crop areas have been outlined. The crop competitions have also been a big factor in convincing growers that measures are necessary to reduce the percentage of virus diseases in the potato crops of the State, but that there is room for improvement, both in the standard of seed produced and in the organising of the channels by which good seed is made available, the crops above referred to make very plain.

Good Seed Pays.

Of these degenerative diseases leaf roll is most common in New South Wales crops, and was particularly conspicuous in many of the coastal crops inspected during the year. In striking contrast to these poor crops were the very fine crops of a number of coastal farmers who purchased their seed from some of the well-known growers, who for the most part have been regular winners in the potato crop competitions in tableland areas. Although a certain amount of virus disease is present even in the best strains available, yields of 8 tons were obtained as against almost failures from many of the other crops grown from seed of which nothing was known as to the crop from which it was obtained. Farmers who have purchased the good seed state that it is economical to pay even a premium of £3 per ton over the ordinary market price, as the results from the crop are so much superior to those from potatoes grown from unselected seed.

The Problem of Obtaining Good Seed.

The question of seed potato improvement was discussed at the last annual conference of the New South Wales Agricultural Bureau, when the need for organisation in this relation was emphasised. It was pointed out on that occasion by the writer that in coastal districts (where the individual areas were small, but the aggregate area was considerable) it was necessary to secure supplies of seed each year from main-crop districts, but that although a number of growers were now realising the wisdom of using only high-class seed, purchased from some reliable source, the procuring of such seed was often economically impossible under existing conditions.

Some coastal growers now purchase their seed from men who can be relied upon to supply each year a quantity of seed which is of a satisfactory standard. Unfortunately, however, owing to the additional freight charges when purchasing small supplies direct, many growers are more or less forced to purchase from the local dealer, who for the most part buys seed in the open market with no further guarantee than that the bags contain potatoes. Nothing is known of the standard of the crop from which the so-called seed was obtained. The coastal grower who buys his seed in this manner is taking his chance in a lottery—he may be lucky and secure a good strain free from degeneration disease, or, on the other hand, he may draw a blank in the form of a degenerate strain of mixed varieties and types.

A Workable Scheme.

The question arises as to how these coastal growers can secure guaranteed seed at a reasonable cost. To my mind the problem could be solved by the formation of local organisations both by the purchasers (coastal growers) and the growers of the seed (tableland growers). In the case of the growers of seed the Department of Agriculture is prepared to inspect the growing crops with a view to registering those of an approved standard of purity and freedom from disease, but this action is not sufficient to protect the buyers in coastal areas. The Department is not in a position to police the grading of the produce after digging, or to prevent unscrupulous growers (who may have obtained registration of portion of their crops) from disposing of seed from crops on their farm which were not of the required standard, or the possibility of the grower buying from other farmers whose crops were not inspected. It is necessary that growers of seed in each locality should organise, preferably on a co-operative basis. The local association would then have its own registered brand and would be responsible for seeing that only seed from registered areas was sold, and that the grading was of a necessary high standard, affixing to each bag a sealing tag, which, with its brand, would constitute a guarantee. Such association could then arrange for bulk supply to the coastal association, which would need to be constituted for trading purposes.

Since the above scheme was brought forward, the Potato Growers' Council of New South Wales has come into operation. One of its objects is to foster such local organisation, and it is satisfactory to be able to state that steps have already been taken in this direction by some of the members in more than one locality.

THE RESULTS OF UNDERSTOCKING SOWN PASTURES—A CORRECTION.

ON page 42 of the January issue of the *Agricultural Gazette* it is stated that continued *overstocking* of sown pastures is likely to lead to the stronger growers becoming dominant to the exclusion of the finer types and to loss of feed on account of the grasses seeding and becoming more or less harsh, unpalatable and innutritious. The word understocking should be substituted for overstocking.

Sugarcane on the Richmond River.

RESULTS OF COMPETITIONS COMPLETED IN 1930.

L. S. HARRISON, Special Agricultural Instructor.

THE results of the Malabar and H.Q.5 two-year competitions and the Q.813 one-year competition are given in this article and will be found full of interest to cane-growers, both as regards cultural methods and local soil treatment.

The Malabar Competition.

The Malabar (two-year) competition attracted six entries, which were fairly well distributed throughout the cane-growing areas of the Richmond River. This number, for the first competition of its kind in the State, must be considered satisfactory. It will be seen that the yields per acre vary in the most remarkable manner, and in this connection the importance of drainage, particularly on Richmond River cane lands, has long been recognised and continually stressed.

Loading Cane on to a River Punt.

Particulars of the cultivation methods employed by the different contestants are as follows:—

J. T. Rodgers.—This cane was planted on new land, which was ploughed up deeply in June. It was rotary hoed five times before planting at the end of September, in rows 4½ feet apart with the sets dropped about 18 inches apart. A planter was used. The sets were covered about 3 inches and the land was then rolled, rotary hoed, ploughed away and back, chipped, scuffled, middles opened and scuffled again. There was a trace of Fiji disease and a fair percentage of mosaic. Early ploughing is to be commended as a favourable practice at all times.

A. W. Rippon.—The land used by this grower was half new land, while the other half had been cropped about seven years to cane. Ploughing took place in August, after which it was ploughed two or three times. Using a planter, sets were dropped closely together in rows 5 feet apart. A light cover was given, it was then ploughed away, rolled and cultivated and hoed as necessary. There was a trace of Fiji disease in this crop.

Mr. J. T. Rodgers' Winning Crop of Malabar.

P. McDonald. — This was planted on new land which was ploughed in September and planted deeply in October and covered fairly heavily. A planter was used. Rows were spaced 5 feet apart and sets dropped about every 15 inches. After planting it was raked off and scarified twice.

R. C. Spencer.—This land had been under cultivation about six years and was out of crop the previous year, cowpeas and maize having been planted prior to ploughing in April for the cane crop. It was ploughed twice after that and planted in September with the machine in rows 4½ feet apart and sets about every 2 feet. The crop was ploughed away from and back a few weeks after planting, after which it was ploughed twice away and back, scuffled and middles opened. There was a fair percentage of mosaic, but only a trace of Fiji disease.

A. E. Ellis.—This plot was on old land which had been under cultivation for approximately forty years, cane having been ploughed-in in 1927, after which a crop of maize and cowpeas was ploughed-in in May and June. Planting took place in September with a planter, the rows being spaced 4½ feet apart and the sets approximately 15 inches apart. They were covered with a plough and then rolled, ploughed away, then hand-raked and given about three subsequent ploughings, scuffled four or five times and hill ploughed.

W. A. Anderson.—The previous crop of this paddock was cane, which was ploughed out for feed purposes the previous May. The paddock was ploughed again and planted in August with a planter, the rows being spaced 4½ feet apart with sets about every foot. It was lightly covered and raked off, ploughed away and back twice, and centres scuffled out.

It will be seen that new land was used by the first and third place-getters and for half the area of the second. This is a matter of some significance in cropping detail, as by such means growers on the Richmond can usually be sure of fairly satisfactory returns, other conditions being normal. In the case of the next place-getter the land had only been under cane crop for one previous planting, and a comparison of the yields obtained by the first four place-getters with those obtained by competitors who used old cane land is enlightening.

Where new land has been relied upon in this competition to obtain results the value of proved cultural practices is not so definitely indicated, although a discussion of them should prove interesting. Treatments after planting varied considerably, and some growers dispensed with ploughing away and back. The efficacy of this operation (apart from weed control and regulation of cover depth) is open to some doubt, particularly in the case of plant cane. It might with advantage be given less frequently in such crops, although there is no definite evidence throughout this competition to prove that it has had a deleterious effect. The matter is one, however, that is worth the grower's careful attention. Weed control should be attempted prior to planting the crop, when conditions for the purpose are most suitable. Moreover, growing conditions for the cane are considerably advantaged by early weed control. In one case at least too much cover was given the crop, which checked stooling, whilst in another case unsatisfactory drainage had a most serious effect on the growth of the cane throughout.

The H.Q.5 Competition.

Three entries were received in this competition, the H.Q.5 cane being planted on approved areas only.

The cultural methods employed by the three competitors were as follows:—

E. Ellis.—This was the second crop of cane, maize having failed and been ploughed out in November. The land was ploughed again in July and later in August. Planting took place in September with the machine, in rows 4½ feet apart, sets being dropped every 18 inches. A light cover was given, after which it was ploughed away and back three times, raked off with harrows and hilled.

W. J. Ellis.—This land had been approximately thirty years under cultivation, the previous crop being cane, after which a heavy crop of cowpeas was ploughed-in in April. Planting took place in September with the planter, in rows 4½ feet apart, sets being about 12 inches apart. The crop was lightly harrowed and raked off, later being ploughed away and back three or four times and scuffled until February, when it was hilled.

A. E. Ellis.—This area was an old cultivation land, cane being ploughed out in 1927 and maize and cowpeas following. It was ploughed in May and June prior to planting in October with a planter in rows 4½ feet apart, sets being approximately a foot apart. Covering was given with a plough, then it was ploughed away and back and hand-raked away, ploughed three times, scuffled four or five times and hilled.

The drainage in the case of some competitors was not as satisfactorily attended to as it might have been, this problem being, as previously mentioned, a matter of supreme importance to cane-growers. Very little disease was found among the three entries, and it will be noted that the newest land again, as in the Malabar competition, produced the winning crop. This alone is not of definite significance, but serves to show very clearly that soil fertility must be maintained, new land naturally being well supplied with humus or organic matter, which becomes depleted through after-cultivations and croppings. This may best be remedied by the growing and utilisation of green manure crops, particularly legumes such as cowpeas, and by trash conservation. The ploughing-in of green crops supplies plant foods and humus, and it will be noted in the case of the second competitor that a heavy crop of cowpeas was ploughed-in prior to planting the cane crop. The heaviest tonnage per acre was recorded by this competitor.

The Q.813 One-year Competition.

This competition received a fair measure of support, and is the first one-year cane competition to be held on the Richmond River. Eleven entries were received.

A fair amount of variation will be noted in points awarded the different competitors, but these must be considered particularly in their relation to soil quality and locality. Undoubtedly drainage plays a highly important part in the matter, but even this must take second place to the other factors mentioned.

Particulars of the leading entries are as follows:—

S. W. Tully.—This land had been under cultivation about eight years, three crops of cane having been taken off before the land was planted to maize and then ploughed in June, after which it was harrowed, ploughed and harrowed again. Planting took place at the end of August with a planter in rows 4 feet 2 inches apart, sets about every foot in the row, and covered about 2½ inches deep. It was ploughed away and back three times with harrowings in between.

W. J. Scandrett.—This land had been under cultivation fourteen years. The previous crop was cane followed by maize. The land was ploughed towards the end of August, and later ploughed three times. Planting took place at end of September, single sets being dropped by the planter in rows 4½ feet apart. After planting it was ploughed away, scuffled three or four times and hilled.

P. H. Jurd.—This land had been under cultivation about nine years. The previous crop was cane, followed by maize, which was ploughed-in in September. It was disc hoed and reploughed, and planted about the middle of October in rows 4½ feet apart, sets about 10 inches apart being dropped with a planter and covered with a plough. It was ploughed away shortly after planting and 2 inches of cover scuffled off, and then scuffled seven or eight times.

A. W. Rippon.—This land had been under cultivation for about eight years, a crop of maize having been planted following the last crop of cane. It was rotary hoed in July and ploughed twice before planting in the middle of October, sets double dropped by hand in rows 4½ feet apart. It was lightly covered with a plough. Afterwards the crop was ploughed away, cross harrowed, ploughed away and back three times, scuffled three times, cultivated and hoed off where too heavy, centres split and scuffled.

The practices in this competition again largely disclose an absence of ploughed-in green crops prior to cane, although the practice is of supreme importance to the ensuing cane crop. Admittedly a number of competitors planted cane after maize, but this, although an excellent practice, both in regard to soil improvement and on the score of economy (the maize showing a commercial return), the direct cane value is not so great as when a green leguminous crop such as cowpeas is turned under. When ploughing-in maize stalks late or just prior to planting it may occur that in dry spring insufficient moisture is present to break down the stalks entirely, and this is likely to cause air spaces and a drying out of soil moisture which cannot be spared at that juncture. Thus early ploughing is a matter of the first importance when a heavy cover of dry stalks is being turned under.

The Awards.

The prizes were allotted as follows:—

Malabar—1st £3 3s., 2nd £1 1s.
H.Q. 5—1st £2 10s., 2nd 15s.
Q.813—1st £2 10s., 2nd £1 15s., 3rd 15s.

The Colonial Sugar Refining Company, through its officers at Broadwater, afforded valuable assistance, whilst its action in augmenting the prize money was also greatly appreciated.

AWARDS in the Richmond River, Malabah H.Q.5, and Q.813 Competitions.

Competitors.	Cultivation (Max. 20 points).	Evenness and Lack of Patchiness (Max. 20 points).	Stooling (Max. 10 points).	Freedom from Disease (Max. 15 points).	Freedom from Lodging (Max. 10 points).	Value (2 points for every £7 10s. in value).*	Estimated tonnage per acre.	P O C.S.	Net Value after Deducting Harvesting Expenses			Total Points.
									£	s.	d.	
Malabar Competition.												
J. T. Rodgers ...	19	19½	8	10	10	20	50	13	76	5	0	86½
A. W. Rippon ...	19½	19	8½	14	10	14	40	12	53	6	8	85
P. McDonald ...	17	17	7½	14½	10	16	40	13	61	0	0	82
R. C. Spencer ...	17	15	6	9	10	14	40	12	53	6	8	71
A. E. Ellis	15	15	4	14	10	10	25	13	38	2	6	68
W. A. Anderson ...	12	12	6	14½	10	5	15	12	20	0	0	59½
H.Q.5 Competition.												
E. and L. Ellis ...	16	19	9	14½	10	14	30	14	51	10	0	82½
W. J. Ellis	17	18	8	14½	9	14	35	13	53	7	6	80½
A. E. Ellis	16	17	6	14½	10	11	25	14	42	18	4	74½
Q.813 Competition.												
S. W. Tully... ...	19½	16½	8	14½	9½	16	35	14	60	1	8	84
W. J. Scandrett ...	19	18	9½	15	10	11	25	14	42	18	4	82½
P. H. Jurd	17½	17	8	15	10	12	30	13	45	15	0	79½
A. W. Rippon ...	19	15	9	15	9½	12	30	13	45	15	0	79½
F. Newport... . .	17	16	6	15	10	15	30	15	57	5	0	79
E. M. Durrington ...	19	14	9	14	9	14	35	13	53	5	0	79
R. V. Lumley ...	19	14	7½	14½	10	13	25	15	47	14	2	78
P. J. O'Connor ...	16½	15½	7½	14	10	13	25	15½	50	2	1	76½
R. C. Spencer ...	17	13½	4½	12	10	10	20	15	38	3	4	67
T. G. Lovett ...	16½	14½	2	14½	10	5	10	15	19	1	8	62½
W. Cruickshanks ...	12	9	5	14½	10	7	15	14	25	15	0	57½

* A strict interpretation of the points would provide that multiples of 2 only appeared in the column for value, but it appears equitable to allot the points as has been done.

HAWKESBURY COLLEGE TRIALS WITH WINTER FODDERS.

THE results of the 1930 trials with winter cereals for fodder at Hawkesbury Agricultural College, reported on by Mr. J. A. Williamson, Experimentalist, indicate that the standard fodder wheat, Clarendon, is very suitable for early fodder, producing both bulk and quality—it yielded 8 tons 18¾ cwt. per acre this year. Earliness in winter fodders is sometimes the main consideration, bulk being often sacrificed. Clarendon was earlier than any of the oats or barleys under trial.

All the oat varieties were better in yield than the wheats or barleys. The standard early oat, Buddah, appears more suitable than Mulga, being as prolific (the yields were approximately 11 tons each per acre) and less susceptible to disease. The standard late oat Sunrise appears more suitable for late fodder than the standard late fodder barley Cape, being as early and more prolific. The early barley Skinless is not as early as Clarendon wheat, no earlier than Buddah oats, and does not yield the bulk of fodder of either.

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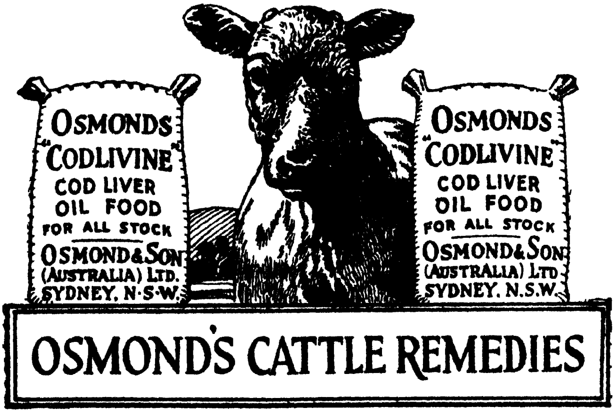

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G. D. ROSS, Under Secretary,
Department of Agriculture,
SYDNEY.

The Effect of Top-dressed Pastures on Wool and Sheep.

E. A. ELLIOTT, Sheep and Wool Expert.

TRIALS to determine the effect of top-dressed pastures on sheep, particularly as regards the weight and quality of wool, were continued last year (they were commenced in 1928) on the properties of Messrs. W. W. Ingrey, "Yarraglen," Grenfell; F. H. Tout and Co., "Wambanumba," Young; and T. F. Rutledge, "Gidleigh," Bungendore.

The Grenfell Trial.

No fertiliser has been applied to this area since the initial dressing of 1 cwt. superphosphate per acre in February, 1928. There was a normal growth of pasture until May, when good rains fell. During this period the top-dressed pasture was stocked at the rate of one and a half sheep per acre, whilst the natural pasture carried only one sheep per acre.* In June trefoils and clovers formed a dense mass of short green feed, being earlier than usual. On 3rd November, 1930, the top-dressed pasture was about 9 inches in height, and consisted chiefly of Haresfoot trefoil, Hop, Ball, Woolly, and Burr clovers, with a fair amount of Wallaby and Panic grasses. The natural pasture showed only sparse clover growth with Rat-tail fescue, barley grass, and corkscrew grass predominating.

Right through the year the wethers remained in very good condition, though the sheep on natural pasture lost an average of 8 lb. between March and shearing time in August. During this period the other group retained their weight without loss. At shearing the wethers off the top-dressed area looked more finished, though both groups were in very good condition.

The following table shows the average body and fleece weights of the sheep on natural and top-dressed pastures at intervals throughout the trial:—

AVERAGE Body and Fleece Weights.

	Natural Pasture		Top-dressed Pasture.	
	Body (shorn) Weight.	Fleece Weight.	Body (shorn) Weight.	Fleece Weight.
	lb.	lb.	lb.	lb.
22nd August, 1929	109·3	12·2	111	12·16
2nd December, 1929	113·6	......	117·6	......
10th March, 1930	134·75	......	133·5	......
20th August, 1930	128·3	12·6	133·8	13·6
Increase in 12 months	17	·4	22·8	1·44

*** Owing to the extremely dry conditions it became necessary to run both lots of sheep (wethers) used in the trial on the untreated area from 14th April till the end of June, so that the additional feed in the top-dressed area could be used for ewes and lambs.**

The wool from the sheep off the top-dressed area was better grown, better nourished, and very slightly broader in quality. Both lots of wool were well grown and attractive. The wool off the natural pasture group showed a slight change in the staple growth about ¾ inch from the skin, which was not present in the other group. Considering the age of the wethers—six years—and the dry season, the cut of wool is exceptionally good.

The following table shows the average weight of wool, value, return per sheep, return per acre, &c., from each lot:—

—	Fleece Weight.	Quality.	Yield.	Value of Wool.	Return per Sheep.	Return per Acre.
	lb.		per cent.	d.	s. d.	s. d.
Natural pasture	12·6	66's	57	11½	12 0	12 0
Top-dressed pasture ...	13·6	66's	54	11	12 5·6	18 8

No detrimental broadening of the fibre of the wool has resulted from running the sheep continuously since April, 1928, on top-dressed pasture, for when selected the wool was 66's. quality, and at shearing in 1930 the quality of both groups was still 66's., although the wool from the top-dressed area was very slightly broader, and because of that and a lower yield, depreciated ½d. per lb. in value. At 1929 shearing, due to a dry season, both groups produced a slightly finer growth of wool, 66's/70's in quality.

The District Veterinary Officer (West) reporting on the health of the sheep in this trial comments that except insofar as increased growth of body and weight of fleece are an indication of greater bodily health, there was no difference between the two groups.

This trial is now terminated as the sheep are six years old.

The Trial at Young.

In this trial, which was carried out on "Wambanumba," the property of Messrs. F. H. Tout and Co., the top-dressed and natural pasture areas were each stocked at the rate of one sheep to the acre.

The top-dressed area in this trial had been treated with 116 lb. of superphosphate in April, 1928, and a further application of this fertiliser at the rate of 1 cwt. per acre was made on 31st May, 1930.

In February, 1930, there was no herbage in either paddock, and the short growth of green grass was slightly more prolific on the top-dressed area. In March the top-dressed area was still greener and had about a 10 per cent. greater bulk of feed. Saffron thistles were very thick, their seed being readily eaten by stock. At the end of April there was only a short green pick at the butts of the grasses, and the small amount of dry feed left was beginning to fail; there was no apparent difference in the appearance of the two paddocks. For the next few months, though the season was dry, there was always sufficient feed for the sheep. When inspected in

September there was a heavy growth of feed in each paddock, though considerably more on the top-dressed area. The bulk of the feed on the latter was made up of clovers and herbage.

The following table shows the average body and fleece weights of the sheep on natural and top-dressed pastures at intervals throughout the trial:—

AVERAGE Body and Fleece Weights.

—	Natural Pasture.		Top-dressed Pasture.	
	Body (shorn) Weight.	Fleece Weight.	Body (shorn) Weight.	Fleece Weight.
	lb.	lb.	lb.	lb.
13th September, 1929	111·4	10	112·6	10·7
18th December, 1929	129·3	......	133·05	......
18th February, 1930	131·65	......	136·75	......
15th April, 1930	132·65	......	134·70	......
23rd September, 1930	136·25	12·75	142·8	12·75
Increase in 12 months	24·85	2·75	30·2	2·05

The wethers on the top-dressed area were 1 lb. heavier at the start of the year's trial, and an advantage was held throughout, though at one weighing there was only 2 lb. difference in weight; this was during the autumn when feed was very dry. At shearing the group on the top-dressed area was over 6 lb. heavier than the other group; at this inspection all sheep were fat, though those off the top-dressed area were more even and appeared more prime.

Both groups showed an ideal growth of wool—sound, attractive, and well nourished with a good creamy colour. There was no noticeable difference between the two groups; if anything the wool off the sheep running on the top-dressed area was slightly lighter in condition than the other lot.

The following table shows the fleece weights, value of wool, and the return per sheep:—

	Fleece Weight.	Quality.	Yield.	Value of Wool.	Return per Sheep.
	lb.		per cent.	d.	s. d.
Natural pasture ...	12·75	66's	59	13	13 9¾
Top-dressed pasture ...	12·75	66's	60	13	13 9¾

No change in quality has resulted from running the sheep in this trial continually on top-dressed pasture, as the quality of the wool has been the same in each group each time it has been examined. When selected at Forbes in May, 1928, the quality was 64's. After a dry season in 1929 the quality of both lots was definitely finer, being 70's/66's, though the wool off the sheep on the top-dressed area had more length, was very slightly more robust, and carried 1 per cent. more condition. This year in both cases it was 66's. quality.

To carry the investigations still further, samples of wool of each group were scoured in exactly the same manner, and after scouring the samples were exactly the same in colour and texture. This was checked by prominent wool men.

The District Veterinary Officer (South), who observed the health of the sheep in this trial, comments that, so far as health is concerned, the results indicate greater metabolic activity in the animals on the top-dressed area and that, so long as sheep are, generally speaking, well nourished, improvement in the feed does not lead to any variation in intestinal parasitism.

Because of their age the sheep in this trial have been replaced with young sheep (2-tooth), which were selected at Forbes in the same way as those used in the trial just completed.

The Bungendore Trial.

The top-dressed area used in this trial on the property of Col. T. F. Rutledge, "Gidleigh," Bungendore, was treated with 1 cwt. of superphosphate per acre in the autumn of 1928, and with a similar quantity on 16th July, 1930.

In April the feed in each paddock was very dry, with slightly more in the manured paddock. There was no apparent difference between the paddocks, each one showing a good growth of crowfoot, Wallaby grass, and trefoil in the two-leaf stage. On 28th October, there was an abundance of herbage and grass in the lower ground in each paddock, but the higher ground in the top-dressed paddock was more thickly covered than the corresponding parts of the check paddock.

The following table shows the average body and fleece weights of the sheep on natural and top-dressed pastures at intervals throughout the year:—

AVERAGE Body and Fleece Weights.

— —	Natural Pasture		Top-dressed Pasture	
	Body (shorn) Weight	Fleece Weight	Body (shorn) Weight.	Fleece Weight.
	lb.	lb.	lb.	lb.
30th October, 1929	106·7	14·5	109·85	15·12
6th February, 1930	123·2	......	127·4	......
15th May, 1930	120·1	......	122·3	......
9th August, 1930	124·4	......	129·2	......
29th October, 1930	136·4	14·7	143·3	15·
Increase in 12 months	29·7	·21	33·45	—·12

The result of the year's trial has been that, although both lots of sheep kept in very good condition throughout the year, those running on the top-dressed area have been consistently heavier and again cut a heavier fleece, though the difference in fleece weight is not so great as last year. This is to be expected, however, as the sheep under natural conditions would be past their normal production as wool cutters. The weights cut are very satisfactory considering the age of the sheep. The sheep on both areas increased considerably in weight in the first three months, November to February. The extremely dry state of the feed meant a slight loss in weight by May, but after that month the wethers began to improve in condition, and by shearing time had reached the maximum body weight of the trial.

The wool from the sheep on the top-dressed area this season was very slightly bolder and broader in growth, but not sufficient to state the difference in "counts." This wool also had a more creamy colour, denoting a little more condition.

The wool from both groups had excellent length, quality, style, and condition, and would all be graded as the same quality, a very good 66's warp. When compared with samples taken last year, no change in quality or length was found. This year's samples being practically the same as last year, except for the natural discoloration due to keeping the wool the twelve months.

The following table shows the average weight of wool, value of wool, and the return per sheep from each lot:—

— —	Fleece Weight	Quality.	Yield.	Value of Wool.	Return per Sheep.
	lb.		per cent.	d.	s. d.
Natural pasture	14·7	66's	58	13	15 11
Top-dressed pasture	15	66's	57	12½	15 7½

In this trial an examination of wool of the three years has shown no difference in the quality. When selected in April, 1928, the wool was 66's quality, and it has remained the same in each group at each inspection. Except for a reduction of ½d. per lb. this season for the wool from the top-dressed group (due to slightly bolder growth and 1 per cent. more condition), the value per lb. has been the same in both lots, while the top-dressed area has each year given a greater average weight of wool per head.

For the first year of the trial the paddocks were stocked under one sheep to the acre as the season was dry and there was very little growth in the pasture, the top-dressed area showing a very slight improvement only. Last year the paddocks were stocked at one sheep to the acre, which is the normal carrying capacity of the property. For the next twelve months of the trial the maximum carrying capacity of each paddock without affecting the normal growth of the wool or the sheep generally will be ascertained. As the original sheep are now over five years old, they have been replaced by young wethers which, at shearing on 28th October, 1930, had average body and fleece weights respectively of 92.9 lb. and 10.3 lb. Samples of the wool showed an attractive type of 66's warp wool, soft, and with good length. The yield was 58 per cent., and on the market of 31st October was valued at 13d.

Blending Honey.

W. A. GOODACRE, Senior Apiary Instructor.

THE blending of honey should interest all apiarists, as upon it depends the retention of the local market. It is little use developing a trade with choice samples and later have to rely on lower grades to retain that trade. And that is what happens if blending is not resorted to, for it is rarely found in any part of the State that the honey produced consists entirely of choice samples. On the chief selling floors of the city the general adoption of the practice of blending has been too long delayed, and it is to be hoped that the operations of the Honey Marketing Board will demonstrate the value of the practice.

With a number of different grades available, the choice lots move off freely and the difficulty then arises of disposing of the lower grades. Blending, on the other hand, would allow of the whole floor being cleared practically at the one time. Moreover, if some variation in flavour is desired from time to time to meet a new demand, this could be arranged.

As an illustration of the value of blending, it might be mentioned that it is possible to produce a first-grade product from two second-grade samples, one of which is strong in the points where the other is weakest. The two samples if sold as straight lines would be difficult to dispose of.

In preparation for blending, each lot of honey will need to be carefully sampled and its quality assessed as regards flavour, colour, density, and aroma. Whether it is desired to blend for the local trade or for a wholesale house, the apiarist must keep each extraction of honey separate, for mixed samples make the work of blending very difficult, involving much additional time in sorting. Successful blending depends upon using sufficient of the higher-grade honey to tone down the darker or more highly flavoured samples.

The blending should be carried out on a small scale first, the quantities of each grade of honey used being carefully measured. This test blend is heated (not above 140 deg. Fahr.) and then thoroughly mixed, and if it is found to be satisfactory, the percentages of the different grades used can be taken as a guide for the mixing of larger quantities. If the blend is darker than desired, then a larger quantity of the light grade must be used; if too strong in flavour, then it must be further toned down by a larger percentage of the mild honey, and so on. Candied honey will require to be heated in order to liquefy it and then poured into the blending tank whilst rather warm. Particular care should be exercised to see that the different lines of honey are poured into the blending tank in such order as will ensure the most thorough mixing of the various grades. Careful work in this direction will save much subsequent stirring.

If the honey is to be blended by the Honey Marketing Board, selected straight lines of honey can be sent direct to the Board's floor, where expert supervision and up-to-date plant are available to blend to the quality desired.

The Pineapple.

G. B. BARNETT, Fruit Inspector, Grafton.

THE growing of pineapples is a profitable sideline for the banana-grower or mixed farmer on the North Coast. Providing the plants are grown out of reach of frosts and protected from strong winds, and on land with good drainage, they do well on most of the many types of soil between Tweed Heads and Kempsey. The most suitable soil is a light, well-drained, sandy loam. The period of profitableness of a plantation varies from five to eight years, though with thorough cultivation and manuring it may last longer.

Soil Preparation.

The land should be cleared of all timber, and any weeds should be either turned under or destroyed. It should subsequently be ploughed and all weed growth kept down. As pineapples are planted close together it is essential that the ground should be as free as possible from weeds, especially paspalum, couch and Johnson grasses, &c. Unless the ground is clean the cost of keeping grasses in check would be almost prohibitive, as most of the work in the vicinity of the plants must be carried out by hand.

The soil should be brought to a good tilth before planting is commenced. October to December are the most suitable months for planting.

Methods of Propagation.

The most popular type of plant used to commence the plantation is a "sucker" which shoots from the base of the parent plant, the sucker coming into bearing quicker than other type of plant used. The "nib" or "robber" is preferred by many growers because it produces a better first fruit than the sucker, although it takes some months longer to come into bearing. The nib or robber develops from buds at the base of the fruit. "Crowns," or "tops," which grow on the head of the fruit, can be used, but at least two years elapse before fruit is produced on plants raised by this means.

The price of suckers averages 50s. per thousand, nibs costing a little more.

Prior to planting, the leaves at the base of the sucker should be pulled off, thus giving the roots a chance to start. When planting nibs or robbers the bulb at the base of the nib should be cut off and several leaves at the base removed.

It is of vital importance, whatever kind of plants are used for propagating purposes, that they should be selected from healthy, robust parent plants that have borne heavy crops of good quality fruits. The indiscriminate planting of anything in the shape of plants, having no regard for physical defects, such as deformities, cripples, or barren plants, is courting failure. Careful selection at planting time greatly assists in the advancement of any plantation.

When plants are required to be moved long distances it is of advantage to cut back the leaves, thus avoiding smashing of young centre leaves and allowing the plants to be bagged more firmly, and consequently reducing the bulk. Cutting back of the leaves is not recommended when plants are obtainable handy to the area it is intended to plant, as the cutting causes the leaves to bleed.

Showing the Different Parts of the Plant Used for Propagation.

1. Sucker. 2. Nib. 3. Crown.

Illustrating Fruiting Habit on Suckers of Full-bearing Plant.

Varieties.

There are a good many varieties of pineapples, but, for commercial purposes, the most widely grown—being the best flavoured, the most hardy, and the best shippers—are Smooth-leaved Cayenne, Queen and Ripley Queen (or Ripley). In the North Coast district, from Tweed Heads to Coff's Harbour, the Smooth-leaved Cayenne has proved the most satisfactory one to grow.

Queen.—This variety is free-growing, compact, and handsome, coming quickly to maturity. The fruit is of an attractive deep-yellow colour, very juicy, flesh pale yellow, of exquisite flavour, and a good keeper. The crown is of medium size and the flowers lilac. Weight, 3 to 6 lb.

Smooth-leaved Cayenne.—Leaves long and smooth or with very few spines, broad, dark green; flowers, purple; fruit very large, crown large, pyramidal, dark orange-yellow; flesh, pale yellow, rich, highly flavoured; pips, large, flat. Does not sucker so freely as other varieties. Usually weighs 6 to 10 lb. Largely grown for market.

Ripley Queen (or Ripley).—This variety is not as consistent a bearer as the common Queen, having one main crop and several "off crops." It ripens earlier than Queen and has a better flavour. Flowers purple, pips prominent. The fruit is roundish ovate, slightly compressed at either end and of a pale copper colour when ripe; flesh yellow, firm, rich, and very sweet. The crown is of medium size and takes about twenty-two weeks from flowering to maturity. Weight, 3 to 6 lb.

Methods of Planting.

There are two popular methods of planting, single rows and double rows; the latter is becoming the more popular. In the single-row method the plants are placed 18 to 24 inches apart with 7 to 9 feet between the rows. With the double-row method the plants are placed 18 to 20 inches apart with the two rows 20 to 22 inches apart. The plants in the two rows are not placed opposite each other, but staggered, *i.e.*, with those in one row midway between those in the other. The distance between double-row and double-row is 7 to 9 feet.

The young plants may be set 2 to 3 inches deep, according to size, and may be dropped along the rows by one man, while another follows and plants, first making a hole with a small hand shovel or a dibble. After planting, the soil should be pressed firmly around the young plants with the foot. Care should be taken when planting to prevent the soil entering the crown or heart leaves of the plant, as this will prevent progress and growth of the plant.

If planting on a hillside, plant the rows across the hill, thus avoiding excessive washing of soil from between the rows which would occur during heavy rains if the rows ran up and down the hillside.

During the early years of the plantation the wide space between the rows can be used for growing tomatoes, beans, &c.

Cultivation and "Paper" Mulching.

The root system of the pineapple is shallow, and consequently cultivation around and close to the plant must be carried out by hand, preferably with Dutch hoes, taking care to replace the soil around the plants and not to form mounds. The ground between the double rows, that is the 7 to 9 feet space, may be kept clean by a horse implement, care being taken not to work too close to the plants, or at any time to cover the young plants with soil. The pineapple, like most other fruits, will only do its best when kept free of weeds.

Within recent years the use of what is commonly referred to as "paper" mulch has come rapidly to the fore. This mulch considerably reduces the amount of cultivation and weeding and tends to conserve soil moisture. Claims are made that the yields from mulched plots are greater than those received from the non-mulched areas. The Department is conducting experiments with "paper" mulch, but at present cannot give any definite pronouncement as to its effect upon yield. So far as the experiments have gone, the results tend to show that the cost of cultivation and weeding is reduced, and that during the first few months after planting the plants in the mulched areas make more rapid growth than those not mulched.

Pineapples just Planted Out under Double Row System, using Paper Mulch.
Note how the plants in the double rows are "staggered."

The paper supplied is 3 feet wide and is laid out upon the area to be planted, with a space 4 ft. 6 in. to 5 feet wide between the strips. The uncovered areas enable the rain to penetrate freely into the soil, and make it possible to work the land with horse implements. The edges of the paper are secured by slightly mounding soil over them. The suckers are planted 6 inches in from the edges and are spaced as described on page 149.

Thinning Out of Surplus Growth.

Far too many growers neglect the thinning out of suckers and robbers, and unless this is done the suckers become so numerous that they become weak and sickly and fail to produce marketable fruit. The grower should develop the habit of going through, row for row, during the late winter months and cutting out all nibs or robbers from the pines, and once a sucker has produced a pine the old stump or the portion of the stump above a strong sucker should be removed. A discreet thinning out of suckers is recommended, leaving the strongest, healthiest and most evenly spaced plants to bear the crop.

Fertilisers.

There seems little doubt that the stimulation of this crop by the use of fertilisers pays, but exactly which is the most profitable fertiliser is more debatable. Farmyard manure can be used to great advantage. The following mixture is suggested as likely to give good results:—

Blood and Bone	6 cwt.	per acre
Superphosphate	¾ „	
Sulphate of Ammonia	1 „	
Sulphate of Potash	2½ „	

Picking and Marketing.

In summer the fruit is usually at its best for picking when it has a light pale-green colour upon the eye, while in winter pineapples should be allowed to remain until the fruit shows a slight yellowing about the base; over-ripe fruit loses its flavour. If intended for canning, the fruit may be allowed to be in a still more advanced stage of ripening before picking. It should be severed from the plant at a lower point on the stem than the gill sprouts; the stem and gill sprouts are then cut off at the base of the fruit.

Care should be exercised in the picking and handling of this fruit, as any slight bruise or puncture will militate against its keeping qualities. When cut the fruit should be placed in a basket or lug box, not more than two deep, in such a manner that the spikes or crown will not penetrate into the adjoining fruit. At subsequent handlings the fruit should be handled carefully and not dumped out on to the tables. For carting to the packing-house, vehicles with springs should be used in order to save the fruit from receiving jars and bruises.

If the fruit is picked in hot weather it must be cooled before packing, and if picked in damp weather it should be dried. It is best in all cases to store the fruit in a dry, airy packing-house for from one to two days. During this time the fruit should be set on its crown.

The fruit should be graded to size, and only fruit of the one size and even degree of ripeness packed in each case; nothing detracts from the appearance of a case so much as fruit of different sizes. The tropical fruit case (inside measurements, exclusive of any division, 24¾ inches long, 12 inches wide, x 12 inches deep) should be used. The number of fruit in a case ranges from ten upwards. Slack packing should be avoided; it is best to so pack a case that slight pressure is required to bring the lid into proper position.

The number of pines in each case might with advantage be stencilled on the end of the case, together with the grower's name, leaving the other end for the shipping marks.

Diseases and Pests.

When a pine is found to be sunburnt and going bad from this cause, it should be removed at once and burned or boiled. Fruit damaged in this way soon rots on the plant and then becomes a harbour for beetles and other pests, which in time may attack the healthy fruits.

Sunscald may be reduced by laying a covering of dry grass over the maturing fruit during the summer months.

Rot may be caused by either wet or dry conditions. In the case of the former the centre of the plant or sucker is easily detached from the rest of the plant, the base of the leaves are discoloured, there is considerable moisture and an offensive odour. In the case of dry rot the roots will be found to be rotten, the plant slowly wilts—the leaves showing a variegated or sickly yellow colour—becomes stunted in growth and eventually dies. To obviate this trouble good drainage is essential.

Pests.—The loss from attacks by crows, rats and mice can be greatly reduced by the laying of poison baits on the fruit attacked. Arsenical poison and strychnine are very effective.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with the view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected orange buds to nurserymen during the 1930 budding season, trees from which should be available for planting during the 1931 planting season :—

	Buds of Washington Navel.	Buds of Late Valencia.
T. Adamson, Ermington	3,000	3,000
W. Beck, Epping...	1,000	1,000
A. T. Eyles, Rydalmere	3,000	2,000
J. de Freitas, Fairfield	200	200
R. Hughes, Ermington	1,000	1,000
L. P. Rosen and Son, Carlingford	5,000	1,200
B. E. Yarnall, Ourimbah	100	100

—C. G. Savage, Director of Fruit Culture.

Register Your Orchard Before 28th February.

Attention is invited to the fact that all orchards over a quarter of an acre in extent, also all fruit tree nurseries and banana plantations, irrespective of areas, must be registered on or before 28th February. The maximum penalty for failing to register is £50.

Registration may be made with the nearest Clerk of Petty Sessions, or if there is no C.P.S. in the district the application, accompanied by the fee of 1s. per acre or any part thereof, should be sent to the Accountant, Department of Agriculture, Box 36A, G.P.O., Sydney.

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A. A. RAMSAY, F.C.S., F.A.I.C., Chief Chemist, and G. W. NORRIS,
Assistant Analyst.

In view of the fact that large quantities of weather-stained almonds, which growers find it impossible to market in the shell, are produced each season, experiments were carried out, after consulting with Mr. C. G. Savage, Director of Fruit Culture, with the object of ascertaining the possibility of improving the appearance of these stained nuts by some process which could be economically applied by growers.

Almonds of poor quality, from the point of view of appearance, were used in the experiments, and after a number of trials a successful method was discovered. The treatment should be varied according to the condition of the sample, the correct method being readily ascertained by dipping a small quantity first.

The Process.

Almonds off in colour, but not black stained, can be treated by immersing the nuts in a 1 per cent. sulphurous acid solution for from two to five minutes, or in a ½ per cent. solution for from five to ten minutes. After dipping, the nuts are spread in thin layers (wooden trays are convenient) to dry, turning the nuts occasionally.

Almonds badly stained (black at the base of the nut) have been successfully treated by the following methods:—

Method A.—Immerse the nuts for twenty minutes in chloride of lime (1 oz. per gallon) acidified with acetic acid, then dry for one day, turning them occasionally. Next day dip in 1 per cent. sulphurous acid for five minutes and dry as before.

Method B.—Similar treatment to Method A, but after drying the second time the nuts are washed in several changes of water and again dried as before.

Method C.—Immerse for five minutes in 1 per cent. sulphurous acid, dry for one day and spread out in thin layers; when dry wash with water and again dry, then dip for twenty minutes in chloride of lime (1 oz. per gallon) acidified with acetic acid and dry as before.

Dipping Vessels.

It is recommended that wooden vessels be used; a barrel cut in halves will be found convenient, the size depending upon the quantity of nuts to be treated. It should be possible to immerse completely a 20-lb. parcel of nuts in 5 gallons of solution.

Dipping Bags.

Small bags made of hessian or other very open material are suitable. Where fishing net is procurable the prawn mesh netting is ideal for making dipping bags. It is advisable to make several bags so as the operation is not held up waiting for a sample to drain, as the same solution can be used for quite a large number of immersions.

Preparing Solution.

Sulphurous acid is obtainable from leading druggists at 6d. per lb., containers extra. This acid contains 5 per cent. sulphur dioxide (SO_2) by weight, therefore to make a ½ per cent. solution, empty the contents of one container into the dipping vessel and fill the container with water nine times. For example, suppose the container held a volume equal to 1 quart, then 9 quarts of water must be added making a total volume of 2½ gallons of ½ per cent. solution.

Chloride of Lime.

Chloride of lime contains approximately one-third of its weight of available chlorine. It is obtainable in Sydney at 4d. per lb. and is stocked by most country storekeepers in 7 and 14 lb. containers.

To prepare the solution weigh out the quantity required, place it in a small crockery basin, add a small amount of water and mix into a smooth paste, then add the total volume of water, stir and let stand overnight, then decant off the clear solution for use. The solution is now acidified with acetic acid immediately before dipping. Household vinegar is suitable and may be used at the rate of 1 oz. per gallon of solution.

A STRAIN TEST WITH FACTOR POTATO AT GRAFTON.

To determine the most suitable strain of Factor potatoes a trial was conducted on an alluvial flat at Grafton Experiment Farm in the spring of 1930 Mr. H. A. Grantham, Experimentalist, reports that the sets were planted 4½ inches deep in rows 2 feet 9 inches apart, the sets being 15 inches apart in the rows. Twelve hundredweight of seed per acre was used, the soil being in excellent condition. Harvesting took place on 17th November, and all plots outyielded the check (unselected plots) as the following table shows:—

Strain in order of merit	Yield per acre based on percentage				Percentage Yield
	t.	c.	q.	lb.	
1. O. Frost's Strain (Bannister) ..	5	17	1	21	184
2. Glen Innes ,, ...	5	14	0	15	178·4
3. McPaul's ,, (Taralga) ..	5	10	3	2	173·1
4. Frost Bros. ,, (Bannister) ..	5	4	3	25	168·7
5. McDonald's ,, (Crookwell) ..	4	18	1	18	153·8
6. Lund's ,, (Crookwell) ...	4	13	2	13	146·3
7. John's ,, (Myrtleville) ..	4	12	1	2	144·2
8. Wright's ,, (Taralga) ...	3	18	0	22	122 2
Average of checks (unselected) ..	3	4	0	0	100

Cool Storage of Peaches.

RESULTS OF THE 1930 EXPERIMENTS.

W. LE GAY BRERETON, Chief Fruit Instructor.

A TEST was conducted early in 1930 to ascertain whether it was desirable to wrap peaches to be held in cold store, whether peaches would taint certain other fruits or *vice versa* if held in cold store with them, and to ascertain the commercial storage life of some varieties of peaches.

It was thought that perhaps after removal from cool store to a warmer, humid atmosphere, the moisture which condensed on the fruit would cause the ordinary paper wrapper to become soft and to stick to the hairy surface of the fruit. Therefore, some of each lot were packed without wrappers, some wrapped in ordinary sulphite tissue, and some in paraffin paper. The peaches in this test were packed in the tray used for export of pears—18 inches long x 14½ inches wide x 3½ inches deep.

In all cases the fruit was packed in a single tier and was not drawn up tight as in ordinary packing, but the tier was keyed up to a firm pack by inserting wood wool after the fruit was in place. Wood wool was also used on the bottom and top of the tier and between the fruit and the sides of the tray.

The trays used for the taint test had a division across the centre from side to side. This division was perforated with holes, and was also cut to allow a quarter inch slack top and bottom to enable the air to circulate between the two divisions. The fruit in the taint test was not wrapped, but was packed in wood wool as described above. Peaches were packed in one division and grapes, pears or apples in the other division.

The fruit was held at the Municipal Cold Storage Works, Hay-street, Sydney. The temperature of the room in which the tests were conducted was held at from 34 to 35 deg. Fahr., except when large quantities of fruit were brought in, when it rose to 36 deg., and on two occasions to 38 deg. The manager (Mr. W. J. Williams) and his staff rendered valuable assistance in carrying out this experiment.

Elberta Peaches.

The fruit of this variety was obtained from Mr. J. Tod, of Leeton, and was packed by Mr. T. N. Powell, Fruit Inspector, Leeton. It was picked on the afternoon of 28th January and the morning of the 29th, and was packed and despatched from Leeton on 29th January, being received at the cool store on 31st January. It consisted of fifteen trays not wrapped and fifteen trays wrapped in ordinary sulphite tissue wraps.

The first sample was removed from the cool store on 10th February, and when examined the following day the peaches were found to be in good condition and of typical Elberta flavour.

The fruit was examined again in the store on 17th February and appeared to be holding up well, though it appeared to be ripening. A sample was removed on this date from the cool store and held in the cool store office. When at air temperature this fruit proved to have slightly lost flavour and the flesh was very slightly dry. Mr. Miller (Municipal Cool Stores) was of the opinion that the peaches had a very slight flavour of the wrapper.

Eight trays of fruit were removed from cool store on 18th February; one tray of sulphite-wrapped fruit and one tray of fruit not wrapped were opened and fully exposed to the atmosphere, which was at the time 77 to 78 degrees Fahr. with a humidity of from 74 to 77 per cent. A heavy dew accumulated on the fruit, and though the wrapping paper (sulphite) became moist, it did not become soggy or stick to the fruit. The following morning the fruit and papers appeared dry.

Another six trays of both wrapped and unwrapped fruit were removed from cool store on 18th February, and were allowed to warm to air temperature with trays closed down. These were opened and examined on the 20th February. The fruit and wrappers were apparently dry, and the wrappers were not sticking to the fruit. Both the wrapped and unwrapped fruit were ripening fast and were of good appearance externally, though the skin showed slight wilting round the stalk end. The fruit had lost the turgid feel of fresh fruit and the flesh was starting to go mealy. The flavour had deteriorated to some extent. The same lot examined again on 21st February appeared in much the same condition as on the previous day. Examined on 24th February the fruit was distinctly wilted in appearance and was bitter in flavour. The flesh had not browned.

It is evident that the commercial storage life of these Elberta peaches was under seventeen days and over ten days, which coincides with results from former cool storage experiments with this peach, when the commercial storage life was found to be from twelve to fourteen days.

The Variety J. H. Hale.

This fruit, consisting of ten trays, was obtained from Mr. Hazelwood, of Kelso, Bathurst, and despatched on 18th February, being received at the cool store on 20th February.

A sample was removed from cool store on 24th February, and examined on 25th February. The fruit was not ripe and in excellent condition.

Four trays were removed from cool store on 3rd March and examined on 4th March. The fruit was ripening; flavour and condition were excellent. On 5th March, condition was excellent; flesh firm, flavour very good. Examined on 6th March, the fruit were ripening well; flavour was well retained, and the flesh was still firm and juicy. On 7th March, slightly riper than on the preceding day; flesh slightly softer and skin turning yellow. On 10th March, the fruit was much riper; the skin was yellow, flesh softer; flavour not so good as on 7th March. Examined 11th March, the fruit was in much the same condition as on 10th March, except that the flesh was a little softer.

One tray was removed from the cool store on 10th March and held at the cool store office. Examined on 11th March the fruit was in good eating condition, plump and showed no sign of wilting, but would not stand a long journey.

Mr. Miller (Municipal Cool Stores) examined the peaches from this tray daily until 15th March, and though they ripened they did not break down to that date.

A few specimens were removed from one tray on 17th March. These appeared in excellent condition when opened up. Examined the following day the flesh was very slightly mealy, but flavour was good. When examined on 19th March, the outside appearance was good with no apparent wilting, but when cut the flesh was starting to brown near the stone; flesh mealy and flavour completely flat.

Two trays were removed from cool store on 24th March. Examined on 25th March, the external appearance was quite plump and good; the flesh was fairly juicy—quite passable—flavour partially gone, but still passable. On 26th March the flesh was very mealy and the flavour completely gone.

It is evident that about seventeen days was the limit of the commercial storage life of these J. H. Hale peaches.

The Variety Golden Queen.

This fruit was purchased from Leeton Cannery. It was packed by Mr. T. N. Powell, Fruit Inspector, and consisted of ten trays unwrapped, ten trays in sulphite wraps, and ten trays in paraffin wraps. It was received at the cool store on 13th March.

Two trays in sulphite wrappers and one tray without wrappers were removed from cool store on 24th March. When examined on 25th March, odd specimens showed mould, but this was apparently on fruit slightly damaged before or during packing. Some showed very slight wilt near the stalk end; perhaps this was slightly more evident in unwrapped fruit than in wrapped, but was not sufficiently so to be definite on this point; otherwise wrapping showed no advantage or disadvantage. Flesh and flavour were normal.

A sample removed from cool store on 24th March and examined 31st March showed no deterioration in texture or flavour.

A sample was removed from cool store on 8th April, and examined on 9th April. The appearance was quite good; there was a slight wilt of the skin at the stalk end, but a similar wilt is often noticeable in peaches direct from trees growing in a hot, dry climate. Flesh was sound and flavour characteristic. No difference could be detected between the unwrapped fruit and that wrapped in sulphite or paraffin papers. Peaches of this lot withdrawn from store on the same date and examined at the cool store office showed that the fruit was deteriorating in flavour when held three days after removal from store.

Three trays were removed from cool store on 10th April, and when examined on 12th April, the flavour was going, the flesh becoming slimy and the exterior wilted.

A sample was removed from store on 22nd April, and examined next day. There was some slackness of the skin about the stalk end; this was perhaps a little more apparent in the unwrapped than in either of the wrapped trays. Flesh normal. Examined on 26th April, the flesh was showing browning and softening at stone; flavour somewhat flat, but not entirely gone.

A sample was removed from store on 5th May, and examined on 6th May. The appearance was quite good, but the fruit was soft to the touch; flesh soft, especially round the stone, and many were brown at the stone and extending towards the skin. It was quite evident that the fruit had passed the limit of its commercial storage life. Examined on 8th May, the browning of the flesh round the stone was more pronounced; flavour impaired, but not entirely gone. No difference could be detected between non-wrapped and those in sulphite or paraffin wraps.

The commercial storage life of this variety was apparently a little more than three weeks.

Variety Phillip Cling.

The fruit of this variety was obtained from Leeton Cannery, and packed by Mr. T. N. Powell, Fruit Inspector, Leeton. It consisted of ten trays without wrappers, ten trays in sulphite wraps, and ten trays in paraffin wraps. It was received at the cool store on 14th March, 1930.

One tray of each lot was removed from cool store on 24th March, and when examined on 25th March, odd specimens were showing mould, apparently in fractures of the skin prior to or during packing. Some specimens showed slight shrinkage of skin around the stalk end, but not sufficient to affect their value materially. The shrinkage of the skin was perhaps more prevalent in the wrapped than unwrapped fruit, but was not sufficiently definite to make this point certain. There appeared to be no difference between the paraffin and sulphite wrapped fruit. Flesh texture and flavour were normal. Examined on 31st March, the wrapped fruit were slightly firmer than unwrapped and the flavour excellent; the unwrapped fruit tasted slightly of kernel.

A sample was removed from cool store on 8th April, and examined on 9th April. The exterior appearance was quite good; there was a slight wilt of the skin at the stalk end, but not more than shown in the same variety when received direct from the trees. Flesh sound and flavour characteristic. No apparent difference between unwrapped, sulphite- or paraffin-wrapped fruit. A sample removed from the store at the same time and kept at the cool store office was deteriorating in flavour.

A sample was removed from the store on 10th April, and examined on 12th April. The exterior had a wilted appearance, and the flesh was becoming slimy and flavour was disappearing.

A sample, removed from store on 22nd April, and examined 23rd April, showed some slackness of the skin about the stalk end, but less than Golden Queen removed from store on same date. Examined on 26th April, the fruit was in quite good condition; slackening of skin had not increased. Flesh normal, flavour perhaps very slightly gone. This lot, on the whole, seemed in better condition than that removed from store on 10th April.

A sample was removed from store on 5th May and examined next day. The external appearance was good; slackness about stalk end had not increased. Flesh juicy, very slight browning of flesh at pit. Flavour about the same as those removed from store on 22nd April. No difference could be detected between unwrapped fruit and that paraffin- or sulphite-wrapped. Examined 8th May, browning of flesh round the stone was more pronounced. The flesh, when cut, was slimy, somewhat similar to the flesh of a peach after exposure to sulphur fumes; flavour was normal.

Fruit removed from the store on 12th May, and examined 15th May, was ripe and soft; browning of the flesh was extending from stone towards skin. Flavour deteriorated, but not completely gone. No appreciable difference between unwrapped fruit and those paraffin- or sulphite-wrapped.

The commercial storage life of this variety appeared to be about the same as Golden Queen, though some fruit held for the longer periods was in better condition than Golden Queen held for similar periods.

Variety Pullar's Cling.

This fruit was also obtained from Leeton Cannery and packed by Mr. T. N. Powell, Fruit Inspector, Leeton. It consisted of ten trays each of unwrapped, sulphite-wrapped and paraffin-wrapped fruit, and was received at the cool store on 11th April.

A sample removed from store on 22nd April, and examined next day, showed slight slackening of the skin at stalk end in some specimens, otherwise the external appearance was fresh and plump. Flesh and flavour normal. Examined 26th April, the fruit was in excellent condition; slackening at stalk end had not increased. Flesh and flavour were normal. There was no appreciable difference between unwrapped and paraffin- and sulphite-wrapped fruit.

A sample was removed from store on 5th May, and examined on 6th May. Appearance was good and fresh; flesh texture and flavour were normal, and no difference could be detected between the unwrapped, sulphite- or paraffin-wrapped fruit. When examined on 8th May, both the wrapped and unwrapped fruit had ripened considerably. Some of the naked fruit showed some browning of the flesh near the base of the stone, apparently due to the fracture left by the stalk either when removed at picking or when it dried off later. Otherwise the flesh was normal in texture and flavour. Browning was not detected in either sulphite- or paraffin-wrapped fruit, which was in quite saleable condition.

A sample was removed from store on 12th May, and examined on 15th May. The external appearance of both the sulphite- and paraffin-wrapped fruit quite good; slackening of skin was not more pronounced than in previous sample. A few of the ripest specimens showed some browning about the stone, otherwise the texture of the flesh and the flavour were normal. The naked fruit had shrivelled considerably, and on the whole was riper and many were showing browning of flesh about the stone. The paraffin- and sulphite-wrapped fruit was distinctly superior in condition, both externally and internally, to the unwrapped fruit.

A sample was removed from store on 19th May, and examined on 22nd May. Browning of the flesh next to the pit was more pronounced than in previous sample. There was no appreciable difference between naked fruit and that paraffin- or sulphite-wrapped.

The commercial storage life of this peach was about twenty-four days.

The Taint Tests.

For each of these tests, trays packed half with peaches and half with grapes, apples, or pears were put into cold store to ascertain if the fruits would taint each other.

The first lot consisting of ten trays packed with Elberta peaches and grapes obtained from Cowra Experiment Farm was put into the cool store on 11th February. Samples were withdrawn on 10th March and 17th March and examined on 11th March and 19th March respectively. In each case there was a suspicion that the peaches caused a slight taint to the grapes.

The other lots consisted of peaches and pears and peaches and apples obtained from Bathurst Experiment Farm, and were placed in cool store on 4th April. They were examined at intervals from 12th April to 6th May, but no taint could be detected either way at any time.

Summary.

Though the sulphite wrappers became quite wet when the fruit is removed from store to a higher temperature and a humid atmosphere, the wrappers do not break or adhere to the fruit, provided they are not disturbed until the moisture has dried away again. This applies whether the fruit is exposed directly to the air or left in the packages. On one occasion only did the wrapped fruit show any superiority over the unwrapped whilst in cool store. The wrappers did appear to keep the fruit in fresher appearance after removal from store.

The paraffin wraps showed no superiority over ordinary sulphite tissue wraps.

The varieties held in saleable condition as follows:—

Elberta	12 to 14 days.
J. H. Hale	17 days.
Golden Queen	21 days (about).
Phillip Cling	21 do do
Pullar's Cling	24 do do

There was a suspicion that peaches caused a slight taint to grapes.

There was no indication of any taint between peaches and apples, or peaches and pears.

Orchard Notes.

FEBRUARY.

C. G. SAVAGE AND H. BROADFOOT.

Cultivation.

THIS is the month when trees are forming blossom buds for the following season and consequently every possible means should be taken to make conditions for the trees as nearly ideal as possible. The soil around the trees should be maintained in an open, loose condition, as this assists in conserving soil moisture.

Budding.

Budding can be done this month provided the sap is flowing freely. Best results can only be secured by careful selection of budding wood from proved trees. Undesirable varieties can be worked over to suitable sorts, and where young trees have been planted out and require cross-pollination no time should be lost in making adequate provision for pollinators.

Codling Moth Control.

During this month the apple and pear grower will be chiefly concerned with the harvesting of his crop, but attention must be given to the control of codling moth. All infested fruit should be picked up regularly and boiled or burnt. This must be done while the fruit is actually infested. If the fruit is collected in bags or cases and is allowed to remain until the grubs have escaped, then the collection of the fruit is labour in vain. The work of destruction must be attended to promptly.

Corrugated Cardboard.

Even though the present costs of producing and marketing apples are high, any increase occasioned by the use of corrugated cardboard for lining the tops, bottoms, and sides of cases when packing will be found to be more than offset by increased returns due to absence of bruising of the fruit in transit, the corrugated cardboard acting as a cushion. It is to be preferred to wood-wool, being cleaner, more easily placed in position, and affording greater protection, while there is not the temptation, as there is with wood-wool, to place too much in the top or bottom to make a difficult pack come up to the right height.

Labels for Cases.

There is no doubt that the use of a well-designed label has a decided advantage over stencilling as a method of marking fruit cases; attracting attention, and prejudicing the prospective buyer in favour of the fruit. It is unfortunate, however, that so many growers ship fruit from Australia, each using a different label. It would be much better for our export trade if we had district labels, and though many growers would object strongly to adopting such a scheme there is no doubt that they will eventually have to act along these lines. Owing to the multiplicity of brands, &c., the sorting, stacking, and cataloguing of Australian apples is a far more costly operation than with American apples.

Care should be taken to use a good paste for sticking labels to fruit cases, for in many instances the labels peel off during transit. When stencils are used it is very necessary to have bold, clear marking on the case, for indistinct marking leads to rough handling and delay in sorting and stacking.

Picking, Handling, and Packing Pome Fruit.

Mr. W. W. Cooke, Fruit Instructor in the Goulburn district, has drawn attention to the necessity for care in picking, grading, and packing pome fruit. Though there has been some improvement in this work in the last few years, there are still numerous instances where loss occurs from want of care, and as the quantity of fruit marketed improves in pack and grade so will the defects of bad grading and packing become more evident, and such fruit become more difficult to dispose of.

One of the first steps necessary to improve the quality of the fruit is to exercise more care in picking and handling. Damage is often caused by lack of proper equipment and incorrect methods of handling. The advantages of using a "picking bag" are fairly obvious, but there are fewer in use than one would expect. Fruit that can be reached from the ground may be picked directly into benzine or other suitable cases, *not* into those intended for market, for they would lose their clean and fresh appearance. Picking directly into cases saves time and obviates double handling of the fruit.

The advantages of making several pickings instead of pulling the whole of the fruit from a tree at the one time are not sufficiently realised. By picking-over trees of the same variety several times a line of fruit much more even in size and maturity is obtained, and full advantage is taken of the fact that small specimens will grow considerably larger when those of greater size have been removed.

Where a mechanical sizer is used it is advisable to make sure that it has been correctly assembled. Often a slight adjustment will make an improvement in the sizing and prevent unnecessary damage.

The grading and packing of fruit is sometimes rendered more difficult, and time lost, through the want of sufficient floor space in the fruit house or packing shed. It is almost impossible to have too much room. Where a mechanical sizer is not used, a packing table of sufficient length should be provided, and it is an advantage to have this a moveable one. If of sufficient length, all the fruit of one variety to be packed—up to ten or fifteen cases—can be placed on the table at once. It is then possible to move along the whole length of this table, packing the fruit of each size as it is found. Quite a number of growers endeavour to pack two grades and three or four sizes of fruit from a table which will only hold two or three cases of fruit. It is almost impossible to do this successfully.

Adequate light in the packing shed is of the utmost importance, but is often neglected. The result is that marked fruit is unintentionally packed with first grade.

The chief points to remember are:—

(*a*) Pick only sufficiently mature fruit.
(*b*) Exercise care in handling to prevent damage.
(*c*) Be careful in grading and packing.
(*d*) Use clean cases of good appearance with an attractive label or brand.

A leaflet—"The A.B.C. of Apple-packing"—with diagrams of the different packs and tables giving the counts can be obtained from the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

COVER CROPS IN ORCHARDS.

Early this month (February) is the most suitable time for the sowing of cover crops. The upkeep of humus in orchard soils is of great importance, but the ploughing in of cover crops must be done with great caution or more harm than good will be occasioned. In our inland parts, where the rainfall is only just sufficient for the healthy growth of the tree and production of fruit, it is only during an abnormally wet year that a cover crop can be grown. As it is impossible to forecast with any certainty how the season is going to continue, some risk is involved even in a wet year. In districts of much higher rainfalls the risk is less, of course, as one has only to fear the exception, *i.e.*, when the rainfall is short. Where water is available for irrigation this danger is eliminated, though it must not be forgotten that the cover crop (whether it be a sown crop or a crop of weeds) is competing with the trees, and extra water must be allowed accordingly. The foregoing is taken from Farmers' Bulletin No. 164, *Advice to Fruitgrowers*, which contains a calendar of orchard work for each month of the year. Secure your copy from the Department of Agriculture; price 11d. posted.

A POTATO TRIAL AT LISMORE.

SUMMING up the results of the 1930 potato trials at Wollongbar Experiment Farm, the Experimentalist, Mr. G. Giles, reports:—"The combination of selection of seed and the use of superphosphate under Richmond River conditions gives a very striking increase in the production of better tubers of early potatoes."

Factor (Johns' selected), fertilised with 3 cwt. superphosphate per acre, yielded at the rate of 5 tons 12 cwt. 2 qr. per acre as compared with 3 tons 19 cwt. 1½ qr. from an unmanured plot of the same selection. A manured (3 cwt. superphosphate per acre) plot of unselected seed of Factor yielded 3 tons 6 cwt. 3½ qr. as compared with 2 tons 19 cwt. 1½ qr. from an unselected and unmanured plot.

Poultry Notes.

FEBRUARY.

E. HADLINGTON, Poultry Expert.

Management of Young Stock.

THE most important matters calling for attention on poultry farms at this time of the year are the housing and management of the young stock. Cases have come under notice recently where half-grown birds have become sick, and upon inspection the trouble has been found to be due to faulty housing conditions or overcrowding. It is very difficult to convince some farmers that crowding of young stock or housing them in badly-ventilated quarters is likely to lead to trouble; in most cases to an outbreak of catarrh, which greatly debilitates the birds and leads to much loss if the conditions are not improved.

Advice has been given repeatedly in these "Notes" and elsewhere on the management of young stock, and this advice is backed up by years of definite experience. It has year after year been demonstrated on the poultry sections of the Department's farms that if the young stock are given proper accommodation they can be reared without any trouble, and will attain the most satisfactory development. Despite such convincing evidence one frequently sees growing stock being reared under conditions which sooner or later must lead to trouble.

The Best Type of House.

It cannot be too strongly emphasised that the only safe practice in rearing young stock, particularly where humid weather is experienced, is to house them in small numbers and give as much range as possible. The best class of house for birds after they have learnt to roost is that of the colony type—about 12 to 15 feet long, 6 feet wide, and at least 6 feet high in front and 5 feet at the back. Such a house will accommodate fifty to sixty birds up to the time they are full grown. It is best to have three or four of these houses in a large enclosure, allowing a minimum of 5,000 square feet of run for each fifty birds. The houses should be spaced as far apart as possible, certainly not less than 1 chain.

A set of three portable frames should be provided for each three or four houses, according to the rate at which the stock are moved into these pens. It is necessary to keep the birds confined for a week so that they become "localised," after which they will not go to the wrong houses unless attracted by feeding near one particular house.

Prevent Overcrowding.

One of the common mistakes made is to transfer, say, 150 to 200 half-grown pullets to a large house and think that because they do not fill the roosts there is no danger of crowding. The fact is overlooked that young birds are always likely to pack together on the perches, and if the perches happen to be close together (less than 20 inches apart) trouble is almost sure to result. In some cases the early-hatched birds are housed under these conditions, and because they suffer no ill-effects it is reasoned that the later-hatched birds can be handled the same way; but it has to be remembered that the early stock do not have to contend with the humid conditions until they are nearly mature and are therefore not so likely to be affected, although it is not safe to run any young birds in large numbers until the cooler autumn weather commences.

It astonished me to see the conditions under which many of the young pullets were housed in America, and to note the prevalence of catarrhal troubles. On a number of farms where colony houses were in use they were placed too close together and it was evident that the birds were not evenly distributed. The perching arrangements were such that it would have been surprising to have found the birds unaffected, as the perches were only about 12 inches apart and were placed over high dropping boards, bringing the perches close to the ceilings of the houses, while no ventilation was provided at the back. In England, too, there were a few cases where the young stock were overcrowded and the same troubles resulted.

If poultry-farmers would only realise that the majority of troubles in rearing young stock are due either to overcrowding or to running the birds on a too restricted area, and would set to work to improve matters in this respect, they would save themselves much worry and loss.

The Poultry Industry in Canada.

Since my return from the World's Poultry Congress I have given, per medium of these "Notes," some of my impressions regarding the poultry industry in various countries. This month I shall treat with Canada.

On arrival in Montreal I inquired into the methods adopted for handling eggs in the different provinces of Canada and ascertained that the Canadian regulations provide for four grades of eggs as follows:—

Specials.—25 oz. to the dozen with an air cell less than 3-16 inch. This grade is not numerous, and is only available in certain months.

Extras.—24 oz. to the dozen; air cell less than ¼ inch.

Firsts.—22½ oz. to the dozen; air cell less than ½ inch.

Seconds.—Eggs sound in shell, but which may be weak and watery or have heavy yolks; and other eggs fit for food.

In each of the four grades quality is defined.

The Act provides that all cases of eggs on sale direct to consumers must be marked or labelled in conspicuous letters with the name and class of eggs, and for this purpose differently coloured labels are used. Every seller of eggs must display in a prominent place a card giving particulars of grades and classes of eggs as prescribed in Canadian standards.

No person shall buy for sale or sell any eggs not fit for human consumption. This, of course, involves candling all eggs. Heavy penalties are provided for breaches of the regulations, and numerous inspectors are employed throughout the provinces to enforce the regulations. They are empowered to enter any premises where eggs are on sale, or floors where eggs are packed, and inspect any eggs to see if they are true to label and fit for consumption. They may also inspect eggs in transit. At each inspection the inspector fills in a report form which is forwarded to the Department. In the province of Quebec alone there are six inspectors employed, while the number in other provinces varies according to the output of eggs.

A large proportion of the eggs produced in the eastern provinces are from mixed farms, and there is very little specialised poultry-farming carried on in those parts. I was informed by the Senior Egg Inspector for Quebec that British Columbia eggs are shipped to the eastern provinces and realise a higher price than those produced on the eastern side, owing to their better quality. In 1929 the lowest price for eggs in the eastern provinces was 1s. 3d. per dozen, and the highest price 2s. 6d., while British Columbia eggs realised as high as 2s. 9d. per dozen.

While in Montreal I had a look over one of the leading egg floors and found that the methods of packing, &c., were similar to those adopted in this State prior to the Egg Board floor being established.

Ottawa.

At Ottawa I inspected the Dominion Central Experiment Farm, where various types of houses for layers are demonstrated. Being a cold climate the class of house favoured is of gable roof construction with a ceiling of cotton material on frames, or a slatted ceiling with straw above, which allows the air to circulate through, as does also the cotton covering. Glass or glass substitutes are used for windows in front of the houses, with a row of cotton screens above. The windows can be opened inwards for ventilation in favourable weather. This class of house may be used with or without runs.

One type of colony house in use struck me as being more suitable for a warm than a cold climate, being nothing more than a gable-roofed shelter with no protection whatever at the sides. These are placed in a large netted field and the chickens are put into them after they have learnt to roost. I was assured that they had proved very satisfactory.

Brooding is done in both a hot-water circulating type of house and colony stoves. The hot-water system has pipes underneath the brooders, the heat coming up through a cylinder in the middle and over which is a round hover, the top of the brooder being covered with wire netting. The house is also heated with pipes along one side. No advantage could be shown in having the pipes underneath instead of through a closed box, as we have here. It certainly appeared to me that a good deal of heat was being lost.

The colony brooders are housed in an enclosed type of colony houses (12 feet x 12 feet) in a large netted enclosure, and the chickens are kept confined in a small run until they are old enough to have free range. They may be kept in these houses until of laying age, when they are transferred to the laying quarters and the houses can then be used for breeding pens, but are thoroughly disinfected and spelled before again being used for young stock.

Experiment Work.

A wide range of experiment work is being carried out at the Dominion Experiment Farm. One matter of interest is the hatching results obtained at this and other experiment farms throughout Canada during the past six years. The figures show a range of from 44 per cent. of chickens hatched from fertile eggs in 1924, to 57.6 in 1929, or, put in another way, it took 2.9 eggs to produce a chick in 1924 and 2.1 eggs in 1929. The mortality among chickens up to three weeks ranged from 33 to 13 per cent. The improvement in the later years is attributed to better feeding rations and freedom from intestinal parasites and pullorum disease.

Another experiment, extending over three years, relative to the length of time which should be allowed between hatching and the first feed, showed that the best results were obtained by allowing a fasting period of twenty-four hours after the finish of the hatch. Other groups were fasted forty-eight, sixty, and seventy-two hours from the finish of the hatch.

A preliminary test to determine the effect of administering two drops of a 50 per cent. solution of potassium iodide daily to a pen of thirty birds showed that the birds made a slight gain in body weight, but taking into account cost of extra feed eaten there was no benefit in using the iodine. Further tests are being carried out at the present time with iodine in various forms.

I was able, through the courtesy of Mr. Barry, of the Department of Agriculture, to visit one of the specialised poultry farms about 30 miles out of Ottawa, where I saw a three-decker poultry house in which birds were kept intensively, but was not convinced of any economy as compared with single houses, nor as far as saving of labour was concerned. The farm was one which had been worked up gradually over a number of years and was carrying about 1,000 layers, including some robust utility Plymouth Rocks, but Leghorns were in the majority. The young stock were reared on free range.

Toronto.

In Toronto, I visited the Department of Agriculture and secured particulars of the new regulations for the control of the dressed poultry trade, which are only in force at present as far as export trade is concerned, but will probobly become general within a couple of years. These regulations define the various classes, grades and weights of dressed poultry, and provide for inspection of all such poultry sold.

An enormous volume of market poultry is sold in Canada, the figures for last year being over £13,000,000, or about £1 6s. per head of population, which is, in round figures, 10,000,000.

Ontario Agricultural College.

This College is at Guelph and is a general agricultural college like Hawkesbury Agricultural College, only much larger, although the poultry section is not quite so extensive.

Some excellent work is being carried out in connection with nutrition, particularly with relation to varying amounts and combinations of concentrates, and the effect which these have on egg production and hatchability of eggs. The work has been in progress about three years now, but it is not intended to publish any results until at least five years' work has been completed or until such time as definite conclusions can be arrived at. A couple of points which have already become apparent, however, are that 10 per cent. of milk powder gives results equal to amounts up to 40 per cent., and it has also been found that 20 per cent. tankage, or meat meal, gives no better egg production than 10 per cent. and results in low hatchability.

Experiments are also being conducted to ascertain, if possible, the reason for deaths of embryos during incubation. It has been found that the highest percentage of deaths occur during the first, third, and last three days of incubation.

I was much impressed with the thorough manner in which the experiments were being carried out and have arranged to be supplied with the results when available. I feel that much useful information will accrue from the work on nutrition, but of course the conclusions may require checking under our conditions to ascertain if applicable here.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1931.

Wollongong (W. J. Cochrane)	Feb.	5, 6, 7
Liverpool (B. C. Fitzpatrick)	,,	6, 7
Leeton (W. Rosewarn)	,,	11
Nowra (H. Rauch)	,,	12, 13, 14
Castle Hill (E. Black)	,,	13, 14
Wyong (F. Akhurst)	,,	13, 14
Moruya (H. P. Jeffery)	,,	17, 18
Milton (Rev. S. A. Turner)	,,	18, 19
Newcastle (P. Legoe)	,,	18 to 21
Kangaroo Valley (L. W. Vance)	,,	20, 21
Granville (B. Hyslop)	,,	20, 21
Pambula (L. K. Longhurst)	,,	20, 21
Maitland (M. A. Brown)	,,	25 to 28
Coonabarabran (L. Byrne)	,,	26, 27
Gunning (G. E. Ardill)	,,	26, 27, 28
Blacktown (A. J. Greenaway)	,,	27, 28
Robertson (W .G. Jenkin)	,,	27, 28
Bulga (R. Wilson)	,,	27, 28
Taralga (W. N. Fitzgibbons)	Mar.,	3, 4
Braidwood (H. E. Roberts)	,,	4, 5
Bellingen (J. F. Reynolds)	,,	4, 5
Oberon (F. H. Kelly)	,,	5, 6
Wauchope (F. Suters)	,,	5, 6
Moss Vale (W. Holt)	,,	5, 6, 7
Penrith (C. H. Fulton)	,,	6, 7
Bulahdelah (D. F. Gain)	,,	6, 7
Bowraville (R. H. Usher)	,,	10, 11
Mudgee (T. P. Gallagher)	,,	10, 11, 12
Cooma (G. E. Metcalfe)	,,	11, 12
Crookwell (A. G. McDonald)	,,	12, 13, 14
Gresford (A. R. Brown)	,,	13, 14
Bowral Horse Show (E. Waine)	,,	13, 14
Campbelltown (R. A. Sidman)	,,	13, 14
Rydal (H. Murray)	Mar.	13, 14
Wingello (J. S. Creelman)	,,	14
Nimbin (S. H. Kilmister)	,,	18, 19
Macksville (G. Hughes)	,,	18, 19
Dungog (W. H. Green)	,,	18, 19, 20
Lithgow (E. L. Parker)	,,	19, 20, 21
Camden (G. V. Sidman)	,,	19, 20, 21
Goulburn (T. Higgins)	,,	19, 20, 21
St. Ives (A. Pickering)	,,	20, 21
Batlow (C. S. Gregory)	,,	24, 25
Gundagai (P. J. Sullivan)	,,	24, 25
Gloucester (L. Harris)	,,	25, 26
Muswellbrook (R. C. Sawkins)	,,	25, 26, 27
Brookvale	,,	27, 28
Sydney Royal (G. C. Somerville)	Mar. 30 to April 8	
Kempsey (E. Mitchell)	April	15, 16, 17
Stroud (C. E. Price)	,,	17, 18
Orange (G. L. Williams)	,,	21, 22, 23
Wingham (C. A. Blenkin)	,,	22, 23
Grafton	,,	22 to 25
Richmond (R. B. Tate)	,,	23, 24, 25
Maclean (T. B. Notley)	,,	29, 30
Wallamba (A. E. Carey)	April	30, May 1
Casino (E. J. Pollock)	May	5, 6, 7
Peak Hill (W. Crush)	Aug.	4, 5
Trundle (W. P. Forrest)	,,	18, 19
Condobolin (J. M. Cooney)	,,	25, 26
Wagga (F. H. Croaker)	,,	25, 26, 27
Bogan Gate (J. T. A'Beckett)	Sept.	2
Junee (G. W. Scrivener)	,,	22, 23
Berrigan (R. Wardrop)	,,	30
Hay (G. C. McCracken)	Sept.	30, Oct. 1
Narrandera (J. D. Newth)	Oct.	6, 7

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1st *March*, 1931.

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VOL. XLII. PART 3. MARCH 1, 1931.
Agricultural Gazette of New South Wales.

Wheat and Oat Trials, 1930.

FARMERS' EXPERIMENT PLOTS.

The Middle West Wheat Area.

G. NICHOLSON, H.D.A., Senior Agricultural Instructor.

DURING the 1930 season, wheat variety and manurial trials and oat variety trials were carried out on farmers' experiment plots at a number of centres in the midde west.

The Season.

Although the rainfall for the growing period was ample to meet all requirements, the season could not be regarded as wholly favourable. In fact, on many of the lighter types of soil better crops would have been harvested had less ran fallen during the growing period. Moreover, the unseasonable temperatures during the winter months contributed largely to the development of rust in some crops and to failure in others. Crops were extremely patchy, much depending on the time of sowing, the extent of feeding off and the variety grown. It was not unusual to see ten- to twelve-bag crops growing alongside others which on appearances should have yielded equally as well, but which on closer examination were found to contain mostly shrivelled, undeveloped grain. The most consistent crops both for quantity and quality were grown in the Coonabarabran district.

Rainfall registrations at the ten different centres are shown in the following table, while a more detailed discussion of the season in this part of the State was published in the January issue of the *Agricultural Gazette*, page 1:—

RAINFALL Registrations, 1930.

Month.	Robinson Bros., Tallawang.	W. G. Tranter, Birrawa.	L. Green, Leadville.	C. Craft, Dunedoo.	R. G Norris, Binnaway.	G. H. Border, Purlewaugh.	C. L. Keeping, Bugaldi	G. Hotchkiss, Baradine.	R. Johns Baradine.	L. A. Hatton, Baradine.	T. A. Butler, Teridgerie.	M. Worrell, Kenebri.
					Short Summer Fallow Period.							
January ...	228	260	230	261	225	339	301	324	322	315	360	545
February ...	10	36	35	20	27	320	94	.	30	15	309	20
March ...	125	141	121	145	159	282	508	253	333	172	56	112
Total ...	363	437	386	426	411	941	903	577	685	502	425	677
					Growing Period.							
April	45	95	100	97	77	66	137	21	56	55	60	162
May	196	164	135	159	94	390	399	140	114	265	90	70
June	361	330	410	422	362	438	320	511	534	312	490	386
July	321	332	290	361	260	222	336	257	251	280	248	132
August ...	140	188	185	182	76	79	180	148	183	227	198	129
September ...	84	67	74	59	72	93	122	97	90	88	74	69
October ...	347	396	362	392	355	485	401	341	370	367	412	406
Total ...	1,494	1,572	1,556	1,672	1,296	1,673	1,895	1,515	1,598	1,594	1,572	1,354

Cultural Operations.

Robinson Brothers, Tallawang.—Light red loam, under cultivation for fifty years; for some years it has been sown with oats every alternate season, fed-off until September and then fallowed. The plots were disc ploughed in early September, springtoothed in December, January and March, and sown with a drill—late varieties on 21st April and early varieties on 15th May—using 60 lb. seed and 80 lb. superphosphate per acre. A plump sample of grain was harvested, but it was bleached. The crop was partly infected by rust.

W. J. Tranter, Birrawa.—Light to medium gravelly loam, cropped for twenty years and out to pasture for the past five years. Disc ploughed in September, disc cultivated in January, springtoothed end of February and harrowed early March. Sown with a combine on 17th April, using 60 lb. seed and 70 lb. superphosphate. Plots affected by rust and grain badly bleached by the wet weather in December. Yandilla King, Penny and Wandilla suffered most from rust damage.

L. Green, Leadville.—Grey to brown, light silt loam, under cultivation for a number of years. Disc ploughed 3 inches in January, springtoothed early February, harrowed in March, springtoothed in late March and again in early April, springtoothed and harrowed in May, and sown with a disc drill on 22nd May, using 60 lb. wheat, 50 lb. oats, and 60 lb. superphosphate. The rainfall was excessive for light country and the soil became waterlogged during winter months. The wheat bleached and the yield of oats was seriously reduced by delay in harvesting. Palestine oats lodged badly, while Federation and Bobin wheat were rust infected and the grain was pinched. Gluyas lodged badly and Improved Steinwedel shelled freely.

C. Craft, Dunedoo.—Medium, red, gravelly loam, cropped frequently since 1915, being under wheat in 1928. Disc ploughed in February, harrowed early April, sown with disc drill on 16th May and cross-harrowed. Fifty pounds seed and 56 lb. superphosphate were used at seeding. The oats shelled freely. Union, Federation, Bobin, and Bena were affected by rust and the grain was pinched.

R. G. Norris and T. Williams, Coolah.—Light to medium red virgin loam. Disc ploughed in October 3½ inches, harrowed in November, scarified late February, harrowed mid-April, sown with combine on 14th May, using 47 lb. wheat, 50 lb. oats and 56 lb. superphosphate. Fed-off until mid-August. The oats shelled freely due to delay in harvesting. Minister was badly pinched, while others produced small grain, but of good colour and up to f.a.q. standard.

G. H. Border, Ulamambri.—Light brown loam, old cultivation, out for four years. Disc ploughed 4 inches in August, springtoothed in January, February, and April, and sown with combine on 17th April with 45 lb. seed and no fertiliser. Yield of Penny was reduced by rust, while Rajah and Duchess lodged. Exquisite and Duchess produced an inferior grain sample and other good varieties shelled freely.

T. Samson, Purlewaugh.—Medium, red, rich loam, which had grown three previous crops, being under wheat in 1929. Disc ploughed 3½ inches in January, springtoothed in March and April, and sown with a combine on 25th April with 40 lb. oats and no manure. Frosted back in September prior to coming into ear, but made good recovery following on the rains in October. Oats shelled freely.

C. L. Keeping, Bugaldie.—Rich, heavy, friable, black, basaltic loam. Old cultivation, out for six years prior to 1928, when sown to wheat. Disc ploughed 3 inches in February, springtoothed in March and April, and sown with a combine on 28th May, using 45 lb. seed and no manure. Very rich country and subject to flooding. Varieties made rank dense growth, lodged badly, and became heavily infected with rust. Sample of grain pinched and useless.

G. Hotchkiss, Baradine.—Light brown sandy loam, first crop wheat in 1929. Disc ploughed in January, disced in February, springtoothed in March and April, and sown with a drill on 15th April, using 40 lb. seed and no superphosphate. Most varieties were badly affected by rust and the grain was pinched and below f.a.q. standard. Yandilla King, Federation, Union, Velvet, Rajah and Bobin were severely rusted.

R. Johns, Baradine.—Medium, silty, red loam, with stony and gravelly outcrops; first crop wheat in 1929. Disc ploughed in January, springtoothed twice and harrowed five times, sown 5th May with 45 lb. seed and 56 lb. superphosphate. The soil was worked too fine and set hard after rain, with consequent disappointing results. Varieties also affected by rust and subsequent pinching of the grain.

L. A. Hatton, Baradine.—Light brown, sandy loam; first crop wheat in 1929. Disced 3½ inches in December, springtoothed in February and March, and sown with a combine on 23rd April with 45 lb. seed and no manure. The plots were fed off. Yield of Union, Penny, Turvey, and Rajah was reduced by rust. Riverina and Gluyas, owing to weak straw, broke down badly.

T. A. Butler, Teridgerie.—Medium heavy, rich, red loam that had grown four previous crops, being under wheat in 1929. Disc ploughed 3½ inches in January, disc cultivated in March, springtoothed April, and sown with a combine on 12th April, with 42 lb. seed and no manure. The plots were not fed off, the growth being rank, dense and forward. The crops were badly frosted and affected by rust. Riverina, Nizam, Turvey, and Union were useless and were not harvested, while in other varieties the grain was pinched and below f.a.q. standard.

M. Worrell, Kenebri.—Light red loam that had grown three previous crops, being under wheat in 1929. Disc ploughed 3½ inches in January, springtoothed in March and April and sown with a combine on 9th May, using 42 lb. seed and no manure. Fed-off until the latter part of July; grain of excellent sample. Yields of Aussie, Canberra, Clarendon, Florence, and Riverina were reduced by shelling.

Varieties.

The season provided an excellent opportunity of testing varieties for resistance to disease and suitability to wet conditions. A number of popular varieties partly failed, due to the ravages of disease, haying off and bleaching. Yields have tended to be somewhat inconsistent, but this can be accounted for because of the abnormal seasonal conditions. Much depended on soil type, time of sowing, and the period of feeding off.

RESULTS of Wheat Variety Trials.

Variety.	Robinson Bros., Tallawang.	W. J. Tranter, Birrawa.	L. Green, Leadville.	C. Croft, Dunedoo.	R. G. Norris & T. Williams, Coolah.	G. H. Border, Purlewaugh.	G. Hotchkiss, Baradine.	R. Johns, Baradine.	L. A. Hatton, Baradine.	T. A. Butler, Teridgerie.	M. Worrell, Kenebri.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie	......	......	27 37	......	34 34	......	......	......	29 38	......	32 55
Bald Early ...	......	......	......	......	......	......	......	......	......	......	28 56
Barwang	......	......	......	......	......	......	......	......	27 13	......	......
Bena	......	......	......	18 29	......	......	......	......	......	......	......
Bobin	35 19	......	19 7	27 9	27 59	......	14 55	14 0	......	......	27 19
Bredbo	......	......	......	......	......	......	......	20 53	......	......	34 15
Cadia	......	......	......	......	......	18 45	......	......	......	......	......
Canberra	......	......	......	......	......	......	......	15 32	......	......	26 4
Canimbla ...	31 30	17 31	......	......	......	26 52	......	......	......	......	......
Clarendon ...	......	......	......	......	......	......	18 2	13 3	......	21 52	26 48
Cleveland ...	......	......	......	......	......	21 8	19 24	......	......	......	......
Currawa	......	......	......	......	......	23 54	19 35	11 34	28 22	12 0	28 37
Duchess	......	......	......	......	......	18 47	......	......	......	......	......
Duri	35 1	......	......	......	......	......	......	......	......	......	......
Exquisite ...	......	......	......	......	......	19 3	......	5 30	......	......	......
Federation ...	......	......	13 38	19 50	28 53	......	11 50	......	......	......	......
Florence	......	......	......	......	......	......	......	......	......	......	26 53
Gallipoli	......	23 1	......	......	27 46	19 0	......	9 37	......	9 17	......
Gluyas	......	......	11 44	......	......	......	......	......	17 37	......	23 46
Gullen	......	......	15 49	......	25 28	......	......	......	......	......	......
Improved Steinwedel	......	......	19 29	......	......	......	......	......	......	......	......
Marshall's No. 3	......	18 46	......	......	......	22 40	24 12	......	23 48	......	33 16
Nabawa	34 54	......	28 25	30 47	33 20	......	21 13	11 58	30 4	7 42	37 29
Nizam	......	......	......	......	......	......	......	12 7	......	......	......
Onas	......	......	......	......	......	......	......	8 9	24 36	......	......
Penny	......	18 36	......	......	......	18 41	......	......	21 18	......	......
Riverina	......	......	......	......	......	......	......	11 0	15 45	......	23 20
Rajah	......	......	......	24 44	......	17 27	16 40	......	23 27	5 23	......
Ranee	......	......	......	......	......	......	......	......	......	11 6	......
Turvey	33 34	16 39	......	......	......	22 37	16 4	6 33	19 18	......	......
Union	......	......	......	18 45	......	17 58	11 10	9 23	22 18	......	......
Velvet	......	......	......	......	......	......	4 45	......	......	......	......
Waratah	35 4	......	......	29 47	......	......	22 8	8 9	25 48	18 22	......
Wandilla	......	19 34	......	......	......	......	......	......	......	......	......
Yandilla King ...	......	18 54	......	......	......	......	9 2	......	......	......	......

Nabawa, however, has been a most consistent yielder, and exhibits a greater resistance to disease than any other variety under test. In addition to being highly disease-resistant, it is productive, and can adapt itself to a wide range of conditions. Under test for the past few years Nabawa has yielded consistently in dry and wet seasons and on varying types of soil. When ripe the straw becomes very brittle, and should rain fall on the ripe crop this weakness is intensified, making stripping difficult, due to frequent choking in the comb.

Aussie yielded consistently and gave excellent returns throughout the district. Trials were conducted mainly on the lighter types of loam, for which it appears to be most suited. This variety is fairly rust-resistant, does well under wet adverse conditions, but tends to shell freely. Aussie compared well with Waratah, but was not quite equal to Nabawa.

Barwang yielded satisfactorily at Baradine, but probably the wet season and its relative resistance to rust favoured this variety.

Bobin.—When it is considered that Bobin rusted badly in all trials it yielded remarkably well, but the sample of grain generally was pinched and of inferior quality. Bobin under average conditions is a heavy yielder, but because it is highly susceptible to rust it cannot be recommended for sowing in rust-liable districts.

Waratah, Marshall's No. 3, *Currawa,* and *Duri* gave satisfactory returns, escaping serious damage from rust, although crops of these varieties, even in the same localities, were affected by rust.

Bena, Duchess, Exquisite, Federation, Gluyas, Gullen, Improved Steinwedel, Nizam, Onas, Penny, Rajah, Union, Velvet, and Yandilla King all proved to be highly susceptible to rust attack, and consequently the results obtained were disappointing. Duchess and Exqusite rarely mature a plump sample of grain, and the former has a very brittle straw. Gluyas is weak in the straw. Improved Steinwedel shells freely. Velvet has little to recommend it, and Gullen is not very productive. These might well be discarded in favour of varieties which tend to fill the bags under varying conditions.

Penny and Yandilla King, usually reliable bag fillers, were affected by rust, and furthermore exhibited a distinct tendency to produce a large number of whiteheads and to hay off.

Wheat Manurial Trials.

Manurial trials were conducted at six centres. Federation and Union were used to sow four of the six trials, and unfortunately these were seriously affected by rust, thus to some extent militating against any marked increase that might accrue from the application of superphosphate. However, some satisfactory increases were obtained, and these are sufficient to indicate (backed up by results in previous years) that under some circumstances it is profitable to use superphosphate. In a district where superphosphate is considered by many as of no value the increases shown in the accompanying table are of interest, more so in view of the fact that, following on a number of dry years, the soil would be in a fertile condition and with an ample rainfall should respond without the use of fertiliser. Furthermore, it is known that maximum results from superphosphate are obtained when applied to a crop grown on well-prepared fallow, and as the manurial trials were not sown on well-prepared land the results are all the more striking. Of the plots which gave only small increases, those in one instance were sown on virgin land and in the other two cases on second-crop land, and in one of these two cases the plots were practically ruined by rust. The Dunedoo and Leadville plots, which gave increases of from 4 to 4¾ bushels, were grown on old land that had been out for some time and not fallowed. The increase of 4 bushels at Baradine on light sandy loam, carrying only the second crop, is significant enough to warrant further trials. Not until advanced farming methods, similar to those in operation in the southern section of the State, are practised is it likely that profitable returns will be assured from light to medium applications of superphosphate.

WHEAT Manurial Trial Results.

Treatment.	L. Green, Leadville, (Federation)	C. Cratt, Dunedoo (Federation)	Norris and Williams, Coolah, (Federation)	G Hotchkiss, Baradine, (Waratah).	R. Johns, Baradine, (Union).	L. A. Hatton, Baradine (Waratah)
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
56 lb. superphosphate	18 19	19 50	28 53	26 13	9 23	26 0
No manure	13 38	15 32	28 14	22 8	8 41	25 48
Increase ...	4 41	4 18	0 39	4 5	0 42	0 12

Oat Variety Trials.

The season was most favourable to the growth of oats, and the varieties under test did considerably better than the yields indicate. Most experimenters failed to harvest the oats plots immediately they were ripe, with the result that the oats lodged and shelled out freely, due to rain and windstorms. As all varieties of oats shell badly, it is not sound practice for the farmer to grow the crop unless he is in a position to harvest immediately they reach maturity. For this reason the early and mid-season varieties are to be preferred, as they come in early and can be harvested prior to a start being made with the stripping of the wheat crop. Oats are grown only on a very limited scale in this district, principally because an erroneous idea prevails that the cultivated oat reverts to the wild oat. Because of the climatic conditions excellent opportunities exist for the intensive rotating of oats with wheat, the oat crop being grown with the object of providing green feed during the winter months, and at the same time maintaining the fertility of the soil. Messrs. Robinson Bros., of Tallawang, have been conducing a rotation experiment for some years, oats being sown on the wheat stubble each alternate year. The crop is grazed until September, and the land is then fallowed for the succeeding wheat crop. This rotation, located on very old cultivation land, has proved very successful.

Both Belar and Guyra have given good results and are particularly suited to the cooler parts of the district. These also will withstand more feeding off than the earlier maturers. Mulga, Myall, and Palestine were severely frosted at Coonabarabran, but made a remarkable recovery following on the late spring rains. Palestine in the Leadville plots lodged badly, practically the entire crop being lost, but this was due partly to bad weather and delay in harvesting. At Teridgerie, Algerian failed to mature grain; as a general rule it is too late for this district.

RESULTS of Oat Variety Trials.

Variety.	L. Green, Leadville.	C. Craft, Dunedoo.	Norris & Williams, Coolah.	T. Samson, Purlewaugh	R Johns, Baradine.	T. A. Butler, Teridgerie.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	22 8	27 32	39 30	33 4	14 33	(Failed).
Belar	...	31 34	46 21	36 15	19 31	20 27
Buddah	...	39 28	...	...	...	...
Gidgee	...	...	...	48 16	...	...
Guyra	26 21	34 37	40 35	50 10	15 15	21 29
Lachlan	21 22	...	...	45 38	...	...
Mulga	...	...	28 33	34 28	12 35	18 8
Myall	...	...	...	36 26	...	...
Palestine ..	8 1	.	...	34 33	...	...

Diseases.

Heaviest losses were caused by rust, resulting in reduction of yield and a pinched inferior sample of grain. Rust development occurred during the late winter months, and early-maturing crops suffered most. Dry weather materially checked the spread of rust in the later crops. Forward crops not fed-off were badly rusted, but while those fed-off until late in the spring escaped serious infection, they were subject to foot-rot and haying off. No serious damage was caused by flag smut, and even highly susceptible varieties were comparatively free. Leaf blight and loose smut were in evidence, but infection was only light. Cutworms, army worms, and Rutherglen bugs were numerous in late-maturing crops, and probably hastened ripening and haying off.

Western District (Dubbo Centre).

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

Experiments with wheat and oats were carried out last year on farmers' properties at Eurimbla, Wellington, Wongarbon, Nubingerie, Dubbo, Toongi, Narromine, Wyanga, Coboco, Balladoran, Gilgandra, and Armatree. Owing principally to rust infection and lodging it was not possible to obtain comparative yields in the case of the Coboco and Nubingerie plots.

The Season.

The following table gives the rainfall registrations at the various centres. Detailed comment on the seasonal conditions in this district was given in the January issue of the *Agricultural Gazette,* page 6.

RAINFALL Records.

	Eurimbla.	Wellington.	Wongarbon.	Dubbo (H. Harvey).	Dubbo (G. R. Lee).	Narromine.	Wyanga.	Balladoran.	Gilgandra.	Armatree.	Toongi.
	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.	points.
1929.											
April	...	..	121		.	...	...	145	...	...	130
May	...	...	67	.	.	...	...	15	...	...	30
June	...	...	64	...	25	...	...	80	...	...	61
July	...	...	57	..	57	77	...	65	...	33	82
August	...	130	122	..	117	91	138	154	...	136	148
September	...	119	86	..	68	71	80	110	...	129	18
October	125	155	164	214	140	180	118	203	...	187	211
November	270	139	144	130	198	95	87	85	60	42	172
December	187	163	85	83	78	105	202	0	38	35	159
1930.											
January	263	520	525	538	451	354	88	343	275	381	487
February	76	84	100	23	29	37	75	22	51	58	69
March	156	71	40	108	107	145	13	141	72	210	160
Total on fallow	1,077	1,381	1,575	1,096	1,270	1,155	801	1,363	496	1,211	1 736
April	113	66	94	81	62	45	74	123	84	83	81
May	150	130	217	159	127	86	121	150	140	194	180
June	404	366	289	442	438	661	285	315	285	416	475
July	294	328	340	255	226	252	164	272	227	360	340
August	133	200	174	158	130	207	120	142	88	149	199
September	10	78	30	30	29	39	13	46	34	59	68
October	425	380	386	359	264	296	222	358	337	254	422
Total, growing period	1,529	1,548	1,530	1,484	1,276	1,586	999	1,406	1,195	1,515	1,765
Grand total	2,606	2,929	3,105	2,580	2,546	2,741	1,800	2,769	1,691	2,726	3,501

Cultural Methods.

Eurimbla (J. D. Berney).—Chocolate clay loam of limestone formation; old land. Mouldboard ploughed October 4½ inches deep, scarified late January, harrowed mid-March, springtoothed mid-April, sown with combine on 26th and 27th April, and harrowed after sowing. Wheat was sown at the rate of 60 lb., oats 50 to 55 lb., and superphosphate 80 lb. per acre. Wild oats reduced the yields somewhat, but rust damage was small.

Wellington (Quirk and Everett).—Strong red clay loam of ironstone formation; old land. Scarified early in August 4 inches deep, springtoothed and scarified early December, scarified late January, harrowed early February, harrowed mid-March, sown with combine on 22nd and 23rd April, and harrowed after sowing. Rate of seeding: wheat 50lb., oats 45 to 65 lb., and superphosphate 56 lb. per acre. Harvested 22nd to 27th November. Frosts damaged Geeralying, Rajah, Canberra, and Federation, while rust damaged Geeralying, Federation, Penny, and Turvey. Strong winds in November shelled all oats badly.

Wongarbon (N. H. Hubbard).—Chocolate, clay, self-mulching loam of basalt derivation; old land. Springtoothed (narrow points) March, 1929, cross-springtoothed (lucerne points) June and again in August, springtoothed late October with 5-inch points, springtoothed late December and again late in January, combine sown on 8th and 9th April in dry seed bed with abundant moisture just underneath. Penny, Turvey, Exquisite, and Federation plots were seriously affected by rust, which caused Bena to fail entirely. Frosts did damage to all plots, especially to Geeralying. Army worms in large numbers also helped to reduce yields.

Dubbo (H. J. Harvey).—Medium red loam of alluvial nature; old land, under experiment plots in 1928. Disc ploughed early in October 5 inches deep, scarified late December and again late in January, harrowed mid-March, cross-harrowed late April, combine sown 28th and 29th April, and cross-harrowed after sowing. Rate of seeding: wheat 60 lb., oats 50 lb., and superphosphate 75 lb. per acre. All plots were affected by late frosts and a severe attack of rust made Onas, Rajah, and Exquisite not worth harvesting, and seriously reduced the yields of all other varieties, with the possible exception of Nabawa.

Dubbo (G. R. Lee).—Medium red clay loam; old land. Disc cultivated May, 1929, sown to wheat in June, but the seed failed to germinate; disced late December, springtoothed mid-March, combine sown on 30th April and 1st May, and harrowed after sowing. Wheat was sown at rate of 60 lb., oats 46 to 50 lb. and superphosphate 65 lb. per acre. Rust seriously reduced the yields of all wheat plots except Nabawa. Yields of oat plots were considerably reduced by strong winds early in November, which caused all varieties to shed their grain.

Narromine (Barry O'Neill).—Medium red clay loam of alluvial formation; old land, under experiment plots in 1928. Disc ploughed June, springtoothed September and again in October, harrowed December, springtoothed January, harrowed late March, commenced sowing with hoe drill on 23rd April and completed after rain on 26th April, cross-harrowed after sowing. Wheat was sown at the rate of 55 lb., oats 50 lb., and superphosphate 70 lb. per acre. Rains caused a crust to form, which delayed germination, but timely soaking rains allowed the plants to break through. Harvesting took place in early November. Late frosts affected the yields of most plots and rust caused the grain of Bobin, Riverina, and Federation to pinch badly. Improved Steinwedel shelled out badly in the strong November winds, as also did Belar oats. Other oats were stripped earlier.

Wyanga (S. C. Taylor).—Medium red clay loam which had carried five previous crops. Disc ploughed August, springtoothed late January, combine sown on 1st and 2nd May with wheat at rate of 50 lb., oats 40 lb., and superphosphate 60 lb. per acre. Harvested early December. Marshall's No. 3 and Federation were badly affected by flag smut. Belar and Algerian oats shelled badly in a severe windstorm. These plots were not affected by rust.

Balladoran (J. Parslow).—Sandy grey to heavy clay red loam; old land, under experiment plots in 1928. Springtoothed late March, 1929, disc ploughed early August, springtoothed late October, late January, late March, and again on 1st May, combine sown on 5th and 6th May with light harrows trailing. The plots were seriously reduced in yield by rust and frosts, with the possible exception of Geeralying and Nabawa.

Gilgandra (W. G. Law).—Chocolate to black clay self-mulching loam; Buddah country, old land. Scarified early November and again early in January, harrowed late January after rains, harrowed late April, hoe drill sown on 15th and 16th May with wheat and oats 50 lb. and superphosphate 53 lb. per acre. A severe attack of rust seriously affected the yields of all wheat plots which promised to give high yields; the grain of Exquisite, Duchess, Yandilla King, and Penny was almost worthless. Army worms were present in large numbers late in October and cut down numerous wheat plants, and practically all the Algerian and Belar oat plots.

Armatree (J. S. Hodgson).—Medium red loam; old land. Disc ploughed late June, springtoothed early October, again mid-February, springtoothed 17th March, harrowed early in May, and sown with hoe drill on 6th and 7th May. Wonderful growth promised yields of 40 bushels and over, but late frosts reduced yields of all plots considerably, while rust affected Onas, Bobin, Federation, Gullen and Ranee. Rates of seeding: wheat 50 lb., oats 50 lb., and superphosphate 56 lb. per acre.

YIELDS of Wheat Variety Trials.

Variety.	Eurimbla.	Wellington.	Wongarbon.	Dubbo (H. Harvey).	Dubbo (G. B. Lee).	Narromine.	Wyanga.	Balladoran.	Gilgandra.	Armatree.	Toongi.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Federation	25 35	17 44	7 58	14 45	......	20 20	14 22	9 29	5 57	16 26	18 18
Nabawa	26 28	19 49	29 7	29 32	31 2	32 56	25 1	22 29	24 2	29 12	19 5
Geeralying ...	......	12 47	34 21	19 27	......	......	25 4	26 31	......	32 0	......
Canimbla ...	29 55	......	27 15	......	......	......	......	......	......	......	......
Wandilla	......	......	24 46	......	14 33	......	18 59	......	......	......	......
Penny	......	17 13	15 23	......	......	......	......	......	......	5 40	......
Turvey	27 9	18 54	15 14	......	11 41	......	......	......	......	......	......
Exquisite ...	21 26	11 58	6 46	No results.	......	......	18 42	......	5 14	......	......
Bobin	......	......	......	20 33	......	17 31	......	11 57	15 52	15 45	......
Free Gallipoli ...	......	22 51	......	20 44	......	......	......	15 14	......	......	......
Riverina	......	......	......	9 29	17 47	18 49	......	......	......	......	......
Yandilla King ...	......	......	......	......	11 41	......	......	......	8 37	......	......
Bruce	......	......	......	......	17 50	......	......	......	......	......	......
Bredbo	......	......	......	......	......	29 31	......	......	......	......	28 28
Waratah	......	......	......	......	......	22 20	......	......	......	......	......
Improved Steinwedel	......	......	......	......	......	15 36	......	......	......	......	......
Duri	......	......	......	......	......	......	......	18 11	......	......	......
Rajah	......	9 34	......	No results.	......	......	......	......	19 16	......	......
Ranee	......	......	......	......	......	......	......	......	......	21 25	......
Aussie	......	......	......	......	......	......	......	......	......	30 48	......
Federation (Longerenong) ...	......	......	......	......	......	......	......	7 21	......	......	7 54
Onas	......	......	......	No results.	......	......	......	......	......	9 16	......
Gullen	......	......	......	......	......	......	......	......	......	5 15	......
Bena	26 26	......	No results.	......	......	......	......	......	......	......	......
Duchess	18 15	......	......	......	......	......	......	......	2 42	......	......
Canberra	......	10 7	......	......	......	......	......	......	......	......	......
Marshall's No. 8 ...	......	......	......	......	......	......	11 47	......	......	......	......
Baroota Wonder...	......	......	......	......	......	......	......	......	......	......	16 34
Ford	......	......	......	......	......	......	......	......	......	......	31 1
Clarendon ...	......	......	......	......	......	......	......	......	......	......	7 9
Gresley	......	......	......	......	......	......	......	......	......	......	16 9

Toongi (F. C. Bennett).—Strong red basaltic loam; old land, last cropped in 1927. Mouldboard ploughed in April, harrowed in June and sown with oats which were fed off, scarified late December and again early in February, harrowed mid-March, sown with disc drill on 2nd and 3rd May, and harrowed after sowing. Seed was sown at the rate of 50 lb. and superphosphate 56 lb. per acre. Late frosts seriously reduced the yields of all plots, more particularly in the case of Clarendon and Gresley, while rust affected all varieties except Ford and Nabawa. Owing to late harvest all varieties except Ford and Bredbo showed weak straw habits.

Notes on Wheat Varieties.

The outstanding varieties of the season's trials were Nabawa, Geeralying, Bredbo, Canimbla, and Ford.

Nabawa is a midseason wheat from Western Australia, which has already demonstrated its high yielding qualities under dry conditions and its almost total immunity to flag smut. During the past year it has also shown high resistance to rust and ability to give consistently high yields after making heavy rank early growth, with the result that in future it must be looked upon as a reliable variety to grow on any soil and under any conditions.

Geeralying is another Western Australian early-maturing variety showing high immunity to flag smut. It gave the highest yields in four out of the six centres where it was tested this season. While not as resistant to rust as Nabawa it seems likely to be a useful late-sowing wheat, and may replace varieties like Riverina, Canberra, and Florence.

Ford.—A South Australian, tall-strawed, showy variety, which did exceptionally well at Toongi, the only centre at which it was sown this year. It showed excellent strength of straw, flag smut resistance, and was only slightly affected by rust.

Canimbla.—A Cleveland cross of late-maturing habits. It is resistant to rust, fairly tall in growth, and likely to be a good late-maturing dual-purpose wheat.

Wandilla again gave consistent yields and also showed fair resistance to both rust and flag smut.

Bredbo, a natural cross from Hard Federation, yielded well where tried and seems less liable to diseases than Bena.

Bobin is very liable to rust, but is worth persevering with, as it has undoubted high yielding qualities, particularly under dry conditions, and the rust epidemic is not likely to develop every year.

Free Gallipoli, a Victorian wheat, also yielded well and appears to be one of the best of the Federation types.

Federation used as a mid-season standard wheat has given such poor yields compared with Nabawa that in future it will be discarded in favour of the latter. A Victorian strain of Federation from Longerenong College was largely outyielded by the departmental strain at two centres where tried.

Aussie yielded well at Armatree, and showed considerable resistance to rust.

Yields of Penny, Turvey, Exquisite, Duchess, Bena, Rajah, Onas, Marshall's No. 3, Yandilla King, and Riverina were all more or less seriously affected by rust.

Fertiliser Trials with Wheat.

A manurial trial with Federation was incorporated in all the wheat variety trials. All plots were fertilised with amounts of superphosphate varying from 56 to 80 lb. per acre, the heavier quantities being used where it has been definitely proved that amounts over half a hundredweight are profitable. Many farmers in this portion of the western district do not yet use artificial fertiliser, and these tests with superphosphate are directed towards demonstrating the advantages to be obtained from the application of an average amount with the crop, and no attempt is made to ascertain the maximum amount that can be used with safety.

RESULTS of Fertiliser Trials with Federation Wheat.

Amount of Superphosphate Per Acre.	Eurimbla.	Wellington.	Wongarbon.	Dubbo H. H[illegible]	Narromine.	Wyanga.	Balladoran.	Gilgandra.	Armatree.	Toongi.
	bus lb	bus lb	bus lb	bus lb	bus lb	bus lb	bus lb	bus lb	bus lb	bus lb
50 lb								4 24		
56 lb		17 44					9 29		16 26	18 18
60 lb						14 22				
70 lb			7 58		19 41					
75 lb				14 45						
80 lb	25 35									
Unmanured	19 24	11 6	6 20	7 57	20 20	4 44	7 6	5 57	10 56	11 41
Increase from Superphosphate	6 11	6 38	1 38	6 48		9 38	2 23		5 30	6 37
Decrease from Superphosphate					0 39			1 33		

NOTE.—Army worms were mainly responsible for negative results at Gilgandra, as the manured plot was much the better in appearance.

The results show increased yields of from 1½ to 9½ bushels at all centres except two. The decrease at Narromine was probably due to a severe attack of flag smut in the heavier crop, which was further affected by the dry spell during September, and did not benefit by the October rains to the same extent as the unmanured section.

Superphosphate versus Gypsum.

Experiments were also carried out with superphosphate and gypsum ("Dawson's Fertiliser"), the fertilisers being applied at seeding time, except at Gilgandra, where gypsum at the rate of 1 ton per acre was applied to half an acre on 10th February, and the plot was not sown with wheat until 15th May. Federation was the variety used at all centres.

RESULTS of the Superphosphate *versus* Gypsum Trials.

	Eurimbla (J. Berney).		Wellington (Quirk & Everett)		Wongarbon (N. H. Hubbard)		Dubbo (H. Harvey).		Gilgandra. (W. G. Law).	
	Amount per acre.	Yield.	Amount per acre	Yield.	Amount per acre.	Yield.	Amount per acre.	Yield	Amount per acre.	Yield.
		bus. lb.		bus. lb.		bus. lb.		bus. lb.		bus. lb.
Superphosphate	80 lb.	25 35	56 lb.	17 44	60 lb.	7 58	75 lb.	14 45	50 lb.	4 24
Gypsum	80 lb.	16 24	80 lb.	9 41	112 lb.	8 3	100 lb.	9 5	1 ton	6 46
No manure		19 24	...	11 6	..	6 20	...	7 57	..	5 57

From the results of these trials it would appear that gypsum in small amounts is of no use as a fertilizer for a wheat crop; it will be noticed at Eurimbla and Wellington that it even depressed yields below those obtained from the unmanured areas.

Rate of Seeding Tests with Wheat.

Rate of seeding tests were carried out at eight different centres with amounts of seed ranging from 40 lb. to 75 lb. per acre. Owing to the prevalence of rust comparable results were not obtainable at Wongarbon (Bena) and Balladoran (Nabawa), while yields of Canberra at Armatree were greatly reduced by attacks of rust and by frost.

YIELDS in Rate of Seeding Tests with Wheat.

Amount of seed per acre.	Eurimbla (Turvey).		Wellington (Nabawa).		Dubbo (Canberra).		Gilgandra (Federation).		Armatree (Canberra)	
	Area.	Yield.	Area.	Yield.	Area.	Yield.	Area.	Yield.	Area.	Yield.
	acres.	bus. lb.	acres.	bus. lb.	acres.	bus. lb.	acres.	bus. lb.	acres.	bus. lb.
40 lb.	7·22	17 2	...	...	..	. .	17·58	16 22	3·35	5 7
45 lb.	..	...	..	...	6·32	11 43	...	...	...	..
50 lb.	..	...	6·27	27 43	...	...	.	...	6·28	5 21
55 lb	.	...	...	...	...	...	43·50	16 49	...	...
60 lb.	14·04	20 31	5·84	29 51	7·52	12 53	...	...	...	...
70 lb.	.	...	...	..	...	...	10·68	13 48	...	...
75 lb.	5·32	19 44	7·13	28 11	5·91	13 37	..	...	3·50	6 13

Results this year favoured a 60 to 75 lb. seeding, due to good seasonal conditions at seeding time and throughout the major portion of the growing period. Exceptionally high yields would have been obtained at most centres if rust and frosts had not appeared.

In addition, a test at Armatree in which 50 lb. Canberra wheat was sown with a combine gave a yield of 6 bus. 36 lb. compared with 5 bus. 21 lb. from a similar quantity of seed sown with a disc drill.

Oat Variety Trials.

Oats for grain were tested at eleven centres, in each of which Algerian, a slow-maturing variety, was used as a standard for comparison.

Algerian oats is an excellent variety for the production of fine hay, or large quantities of grain if the season is suitable, but it gets caught too often by dry spring conditions and hays off, with consequent poor results. It is too slow in its early growth to be used for the purpose of feeding off before being allowed to grow a grain or hay crop, a characteristic that is largely demanded of oats in this portion of the west and one which makes a quicker-growing oat than Algerian necessary.

YIELDS of Oat Variety Trials.

Variety.	Eurimbla.	Wellington.	Dubbo (H. Harvey).	Dubbo (G. R. Lee).	Narromine	Wyanga.	Balladoran.	Gilgandra.	Armatree.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus lb	bus. lb
Algerian ...	36 37	34 19	31 20	21 15	25 16	8 15	23 6	Net. stripped	36 8
Belar ...	.	43 32	48 39	31 15	11 15	10 19	42 31	5 2	28 29
Buddah ...	...	...	.	39 20	..	...	...	22 33	...
Gidgee ..	.	..	62 14	...	...		46 3	..	
Guyra ...	38 39	36 1	..	34 7	.	...	...	...	...
Lachlan ...	...	...	.	...	..	...	...	..	.
Mulga ..	14 38	...	.	24 30	33 25	16 7	...	.	45 6
Myall ...	..	...	..	...	...	..	...	...	..
Palestine ...	23 24	27 4	55 32	26 25	24 1	15 27	38 19	28 18	48 34
Sunrise ...	...	...	...	...	...	...	...	.	..

Belar and *Guyra*, two mid-season varieties, have time and again demonstrated their suitability for this dual purpose, as they generally do not shell or lodge as readily as the faster growers like Mulga, Buddah, and Gidgee. This year severe winds early in November adversely affected nearly all oat plots, more particularly Belar, at several centres, while at Wyanga, Gilgandra, Armatree, and Narromine the faster growers had been stripped before the winds occurred.

Gidgee yielded well this year, and *Palestine*, a short-strawed very early-maturing variety, shows distinct promise of being a very suitable grain yielder.

Diseases in Crops.

Stem rust, which had not done any serious damage for fourteen years, appeared extensively this year throughout the whole district and was responsible for considerable losses in yields and grain quality on nearly all farms, more particularly in the vicinity of Dubbo, Eumungerie, and Wellington. Some varieties showed considerable resistance to rust, and among these were Nabawa, Waratah, Aussie, Currawa, Ford, Canimbla, Wandilla, Pusa, Clarednon, and Florence, though in some instances, more particularly on heavy soils, some of these varieties were as badly affected as any others. Time of sowing, as well as the amount of feeding off, had much to do with the amount of infection, and at times even cultural operations and the use, or non-use, of fertilisers seemed to have some influence, on the extent or severity of the rust attack. Oats were not attacked by the particular form of stem rust that was present this year.

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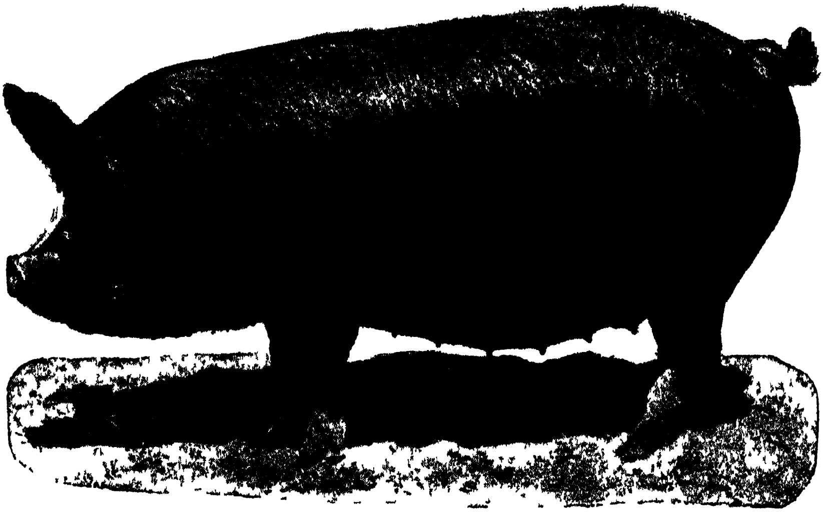

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G. D. ROSS, Under Secretary, Box 36A, G.P.O., SYDNEY.

Flag smut again took toll of susceptible varieties and is probably the disease to be most feared. Take-all and foot-rot showed up prominently this year at Wellington and Cumnock and were responsible for a good deal of loss in those districts. It is also thought that foot-rot attacking plants whose vitality had been weakened by rust attack was responsible in a large degree for the failure of many crops. Late frosts also were responsible for reduction of yields in many centres and probably did more damage than credited with.

In Memoriam.

Mr. H. W. POTTS.

Died 10th February, 1931, aged 75 years.

It is with deepest regret that we record the death, at Innisfail, Queensland, of Mr. H. W. Potts, ex-principal of Hawkesbury Agricultural College, Richmond, New South Wales.

Mr. Potts, though born and educated in England, could truly be called a good Australian, applying his energies and wide knowledge unsparingly for the advancement of agricultural education in this country.

His associations with the Department of Agriculture in this State date from 1902, in which year he accepted the post of Principal of Hawkesbury Agricultural College, relinquishing the position on reaching the retiring age in 1920. During his term as Principal he was instrumental in placing the College in a line with the foremost institutions of its kind in the world.

Apart from his connections with the Department of Agriculture, Mr. Potts took a prominent part in many movements for the advancement of the agrarian industries, not only in New South Wales but in other States, particularly Victoria, where as an officer of the Department of Agriculture in that State he helped materially to establish the dairying industry on sound lines. He also took an active part in the work of the foremost agricultural societies in New South Wales, and was an untiring contributor of articles on agriculture and stock to the leading Australian scientific journals.

Subsequent to his retirement from Hawkesbury Agricultural College, Mr. Potts returned to England and was for some years Principal of the Australian Agricultural Training College at Lynford Hall, where intending migrants were given a groundwork in Australian farming methods. After terminating his connections with this College, he acted as agricultural adviser to the Government of Malta, and returned to this country last year as Commissioner for Malta in Australia.

Evidence of his sterling worth as a teacher will long survive him, as many men whom he trained as students at Hawkesbury Agricultural College now occupy leading positions in various agricultural institutions, not only in the different States of the Commonwealth, but in many English-speaking countries throughout the world.

Varieties of Wheat in New South Wales.

[Continued from page 114.]

J. T. PRIDHAM, H.D.A., Plant Breeder, and A. R. CALLAGHAN, D.Phil., B.Sc., B.Sc.Agr., Assistant Plant Breeder.

As in previous instalments of this article, the varieties described herein are taken in the order of their relative importance in New South Wales at the present time.

To date the following varieties have been dealt with:—Waratah, Federation, Yandilla King, Turvey, Canberra, Nabawa, Bena, Marshall's No. 3, Penny, Hard Federation, Union, Free Gallipoli, Nizam, and Currawa.

Gresley.

Gresley is the outcome of a cross between Federation and Huguenot made in 1909 by Mr. C. Harper, of Western Australia.

The early growth habit of Gresley is semi-erect, but rather sparse in stooling qualities; the foliage, though dark-green, has a somewhat slaty appearance, a character that is more noticeable in the glumes of the spike prior to their change of colour; the leaves are medium-wide to narrow, lax and drooping. Gresley produces tall, white, fine straw of superior strength and standing ability; the straw, together with its general vegetative characters, make the variety valuable for hay and chaff purposes.

It has long, white, tapering, tip-awned spikes of low density. The ear is not so sharply tapering as that of Baroota Wonder, but these varieties can be more readily separated from the characters of the outer glumes; in Gresley the shoulders of the upper outer glumes are distinctly elevated, while those of Baroota Wonder are round. The grain of Gresley belongs to the medium-strong flour class; it is large, yellowish-white with a deep crease, which in some cases is accompanied by a pit, or shrunken depression.

Gresley is susceptible to flag smut, but moderately resistant to leaf rust. Its chief value is as a dual purpose variety of early maturity; it produces good yields of hay which can be converted into chaff suitable for marketing, and if let grow on for grain it will give satisfactory yields. Its value as a grain wheat has, however, been over-estimated. Although not as early as Firbank it has superseded this variety for hay, except in the drier districts. In the last census of varieties taken in New South Wales, Gresley was the ninth leading variety in order of acreage for all purposes, although it occupies only the fifteenth position as a grain wheat. The Department recommends it for hay and green fodder on the Coast, and for hay and grain in the South-western Plains and Western Riverina. It is not sufficiently productive of grain to be recommended as a dual purpose wheat in the Eastern Riverina.

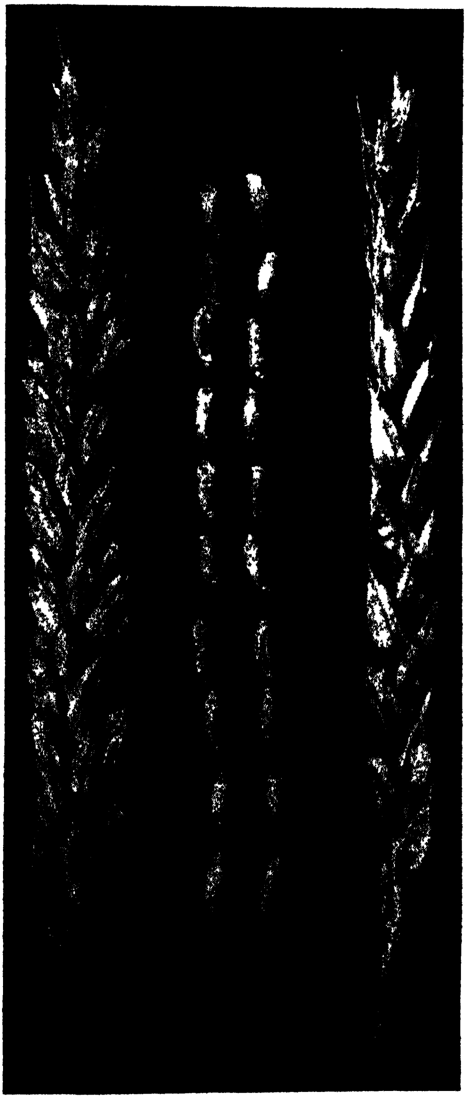
Wandilla.

Wandilla was selected at Cowra Experiment Farm from a cross between Federation and Yandilla King; the cross was originally made at Wagga Experiment Farm in 1907.

Wandilla is prostrate in early growth and is noted for its particularly good tillering ability. The foliage seldom droops much; the leaf-blades are short and rather erect. The straw of Wandilla grows to medium height; it is strong, only medium fine and white, and not very suitable for hay.

It has a white dense, tapering, almost bald ear, with the spikelets very uniformly arrayed. a tendency to "tip-wither" and to produce sterile spikelets at the base of the ear is probably correlated with its profuse stooling habit. The shoulders of the outer glumes of Wandilla are broad and nicely rounded. The variety holds its grain well: the grain is of medium size and belongs to the medium-strong flour class.

It has mostly been found resistant to flag smut under field conditions, though a few instances of susceptibility are recorded. It is, however, susceptible to rust, foot-rot and leaf blight (*Septoria*). It is a late-maturing variety, but it is doubtful if it is more productive than Yandilla King; it is, however, often preferred to the latter variety on account of its greater resistance to flag smut and its less rank growth on strong rich soils. It holds its grain equally as well as Yandilla King, but is just as liable to damage from rust infection.



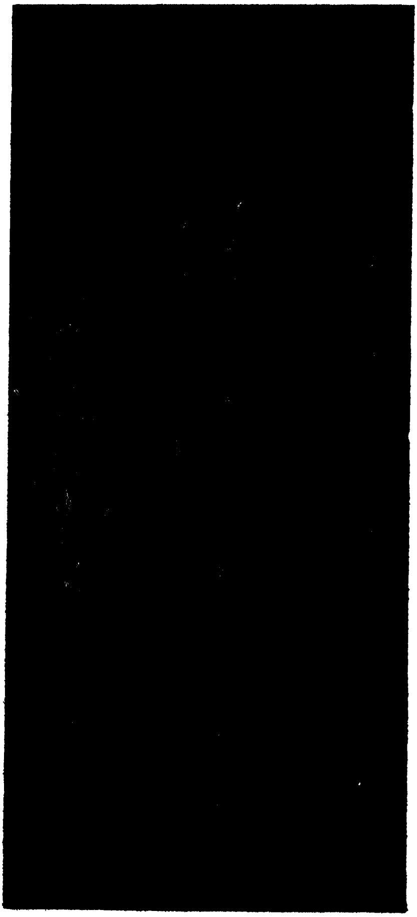
Gresley.

The Department recommends Wandilla for the Central-western and North-western Slopes.

Ranee.

Ranee was bred by the Victorian Department of Agriculture from a cross between Indian F and Federation.

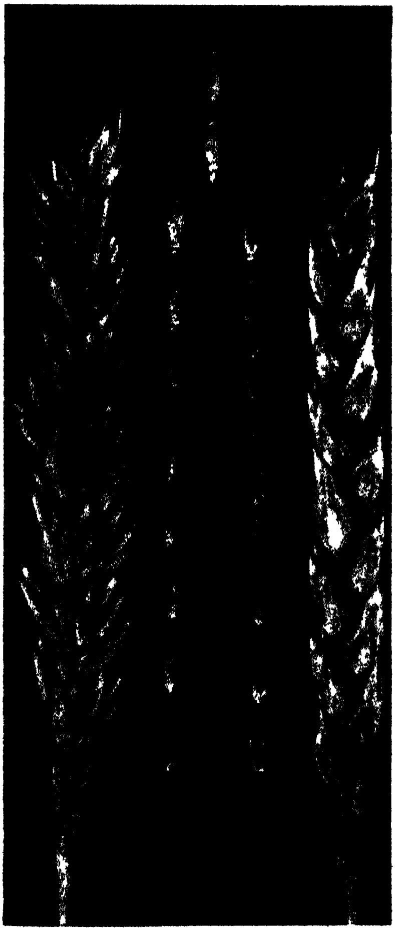
Wandilla.



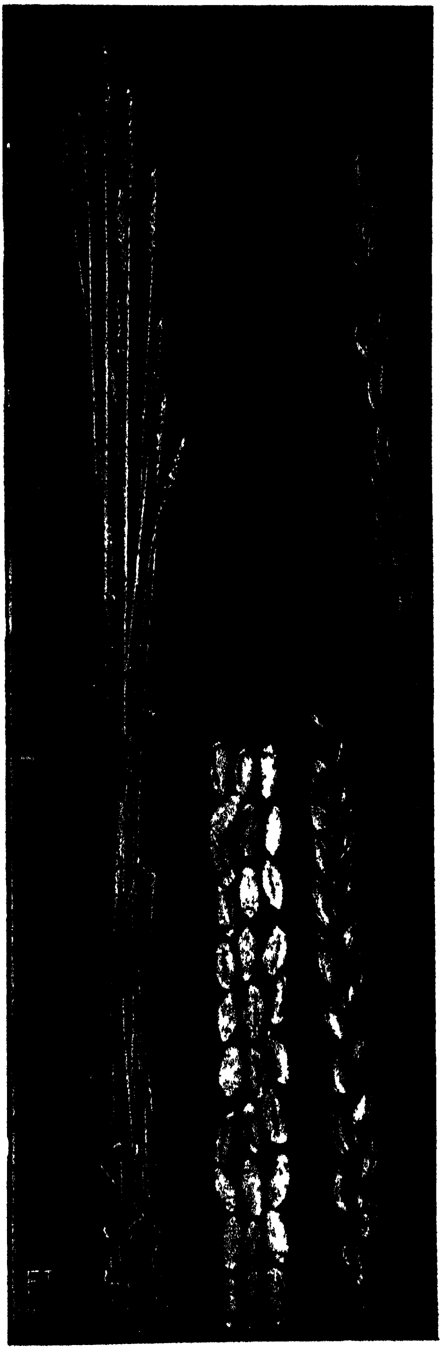
Ranee.

It has fairly broad medium-erect foliage, borne on medium-short straw that is fairly fine but strong, standing stiffly erect. It bears a brown, tip-awned ear of only moderate density. The shoulders of the outer glumes are broad and rounded with some tendency to squareness. The grain is yellowish-white, plump, with a medium-shallow crease and is included in the medium-strong flour class.

Ranee is susceptible to stem rust and flag smut. In this State it appears to suit the drier far western areas, but it is still doubtful whether it is superior to Bobin or Waratah under such conditions. It is, however, the third leading variety of wheat in Victoria, where it has made rapid headway in recent years, and where it is recommended particularly for Mallee soils. Its culture has also extended rapidly in New



Riverina.



Cleveland.

South Wales (from 445 acres in 1925 to 49,291 acres in 1929), but results so far have not yet warranted its inclusion in the Departmental recommendations.

Riverina.

Riverina is a sister to Canberra, selected from the progeny of the same cross.

The stooling is sparse and the early growth erect; the foliage is dark-green; the medium-wide leaf-blades are lax and drooping. The straw is medium-tall, fine, but like Canberra, rather weak and somewhat liable to lodge. The ear of Riverina is white, large, medium dense and almost bald; it resembles Nabawa in general characters, but the shoulders of the outer glumes of Riverina are rounded, while those of Nabawa are decidedly oblique; further, the spikelets of Riverina are usually more spreading and less regularly directed than those of Nabawa The large yellowish-white grain threshes readily and is in the medium-strong milling class.

Riverina is regarded as resistant to flag smut under field conditions, but is prone to stem rust and leaf blight (*Septoria*). Owing to its greater resistance to flag smut it has increased in acreage largely at the expense of Canberra; the statistics show an increase from 3,894 acres in 1925 to 47,543 acres in 1929. The variety has acquired a reputation for palatability both in the green and hay state. It is an early maturing variety, but not so productive as Waratah; however, in the drier districts, where Canberra is still favoured for late sowing, there are indications that Riverina is to be preferred to it. It is included in the Departmental recommendations for grain and hay in the Western Plains, of which Nyngan, Trangie and Condobolin are representative. The variety is not suited to the conditions of the Riverina as its name might imply.

Cleveland.

Cleveland is one of Farrer's crossbreds with the pedigree Fife x Blount's Lambrigg x Purple Straw Tuscan.

In early growth it is prostrate and stools profusely. The straw is white, tall and strong, of only medium fineness. The ears are white, long, rather lax and tapering, bearing only short, minor tip-awns. The shoulders of the outer glumes are rather narrow and rounded. The grain is of medium size and sometimes presents the mottled appearance known as "yellow-berry"; for milling purposes it is classed as medium-strong.

Although susceptible to flag smut, Cleveland maintains its reputation in the cooler areas of the State on account of its productiveness. It is still the standard late-maturing variety for early sowing on the Tablelands, where it is recommended for both hay and grain by the Department. It is also included in the recommendations for the cooler districts of the north and for the Central-western Slopes. In 1929 an area of 31,608 acres was sown to Cleveland in this State, chiefly located in the cooler districts mentioned above.

Purple Straw.

The name Purple Straw represents a number of types which differ slightly in maturity and morphological detail. Purple Straw is a very old wheat, the origin of which is not known. In the United States a variety under this name has been grown for more than a hundred years in the south-eastern States, but it has a tapering head with red grain, and according to descriptions is quite different from the Australian variety. Hudson's Early Purple Straw is the best known type in New South Wales and has proved a valuable parent in cross-breeding work.

Purple Straw.

Aussie.

The young growth is prostrate and vigorous with dark-green, fairly broad, leaves; later growth is rather flaggy, but tall and suitable for hay, the straw having a characteristic purple colouration. The ear is large and bold, usually more compact and dense at the tip than at the base, giving it a clubbed appearance. The grain, which shells readily, is characterised by a deep crease, especially at the brush end, where it is usually deeply pitted; the yellow grain mills freely with an excellent colour; it is included in the weak flour class.

All strains of Purple Straw have in common a susceptibility to flag smut and stem rust. The greatest attribute of the variety, however, is drought resistance combined with productiveness, and this valuable quality has been assimilated into many of our newer varieties such as Waratah, Penny, Turvey and Marshall's No. 3 by selection and cross-breeding. Purple Straw itself has given way to varieties of greater productivity and of greater resistance to disease.

Aussie.

Aussie resulted from a cross made between Federation and Gluyas Early in 1907 at Wagga Experiment Farm.

For an early-maturing variety it tillers well, and in early growth it is semi-erect; the foliage is rather light-green and drooping. The straw is short, with no purple colour, fine and thick-walled; in spite of the latter character it is not strong, but liable to lodge, especially when grown on heavy fertile soils. The heads of Aussie are white and quite bald; they are short and tapering, with spreading, unevenly directed spikelets. The shoulders of the outer glumes are oblique. The yellow grain is easy to thresh and is classed in the weak-flour group. The Western Australian variety Merredin is practically identical with Aussie.

Aussie is moderately susceptible to rust, and very susceptible to flag smut; it also shows some resistance to leaf blight (*Septoria*). On account of its comparative resistance to rust combined with its productiveness it was recommended for the North-western Slopes in 1927, and it is still included in the Departmental recommendations for that district. In recent years it has also given very good results by comparison with Waratah and Canberra in the Riverina. It is reported to be better suited to sandy loams than to heavy soils. The acreage sown to Aussie in New South Wales has increased from 1,470 acres in 1925 to 30,214 acres in 1929. There are indications that after more extensive trials in other districts its popularity may increase still further.

(*To be continued.*)

INFECTIOUS DISEASES REPORTED IN JANUARY.

The following outbreaks of the more important infectious diseases were reported during the month of January, 1931 :—

Anthrax	5
Blackleg	4
Piroplasmosis (tick fever)	12
Pleuro-pneumonia contagiosa	3
Swine fever	Nil.
Contagious pneumonia	1
Necrotic enteritis	1

—**Max Henry, Chief Veterinary Surgeon.**

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GROWERS RECOMMENDED BY THE DEPARTMENT.

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A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36A, G.P.O., Sydney not later than the 12th of the month.

Wheat—

Aussie	Manager, Experiment Farm, Trangie.
	J. Parslow, " Cooya," Balladoran.
Baroota Wonder	Manager, Experiment Farm, Temora.
Bobin	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Condobolin.
	W. W. Watson, " Woodbine," Tichborne
	E. J. Johnson, " Iona," Gunningbland.
Bruce	L. R. Harton, " Ferndale," Werris Creek.
Canberra	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Condobolin.
	Freudenstein Bros., Post Office, Tyagong.
	W. W. Watson, " Woodbine," Tichborne.
	E. J. Johnson, " Iona," Gunningbland.
	F. Penfold, " Bluevale," Boggabri.
Canimbla	A. E. Dixon, "Bramshott," Wallendbeen.
Clarendon	C. Anderson, Swan Vale Post Office, *via* Inverell.
	J. Parslow, " Cooya," Balladoran.
Cleveland	W. Burns, " Goongirwarrie," Carcoar.
Currawa	Manager, Experiment Farm, Temora.
Exquisite	P. Corcoran, "Weeroona," Moombooldool.
Federation	Manager, Experiment Farm, Temora.
	W. G. Law, " Thistledown," Gilgandra.
Firbank	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Condobolin.
Florence	Manager, Experiment Farm, Trangie.
Free Gallipoli	Manager, Experiment Farm, Temora.
Gluyas Early	Manager, Experiment Farm, Temora.
Gullen	P. Corcoran, "Weeroona," Moombooldool.
	Manager, Experiment Farm, Temora.
	W. G. Law, " Thistledown," Gilgandra.
Hard Federation	Manager, Experiment Farm, Trangie.
	L. R. Harton, " Ferndale," Werris Creek.
Improved Steinwedel	Manager, Experiment Farm, Trangie.
Marshall's No. 3	B. J. Stocks, " Linden Hills," Cunningar.
Nabawa	Manager, Experiment Farm, Trangie.
	J. Ralston, "Strathmore Farm," Rand, via Albury.
	G. Hand, "Hill View" Narromine.
	P. Corcoran, "Weeroona," Moombooldool.
	Whitfield Bros., "Gamble," Binnaway.
	R. B. B. Gibbes, "Glenmore,"Old Grenfell Rd., Forbes.
	Manager, Experiment Farm, Condobolin.

Wheat—continued.

Nabawa	... A. D. Dunkley, " Bon Lea," Brundah, Grenfell.
	H. J. Harvey, " Kindalin," Dubbo.
	G. R. Lee, " Oakwood," Dubbo.
	W. G. Law, " Thistledown," Gilgandra.
	J. Parslow, " Cooya," Balladoran.
	R. Massingham, " Aylmerton," Binnaway.
	J. Berney, " Eurimbla," *via* Cumnock.
	A. P. Unger, " Stony Hill," Alectown.
	B. J. Stocks, " Linden Hills," Cunningar.
	R. G. Norris, " Morven," Coolah.
	E. Idiens, " Kangarooby," Goolagong.
	F. Penfold, " Bluevale," Boggabri.
	W. W. Watson, " Woodbine," Tichborne.
	J. P. Cullen, " Redbank," Dubbo.
	Quirk and Everett, " Narrawa," Wellington
	E. J. Johnson, " Iona," Gunningbland.
Ranee	... A. G. Manning, "Irriga," Ungarie.
Thew	... L. G. Pryor, "Eriston" Gunnedah.
Turvey	... W. W. Watson, " Woodbine," Tichborne.
Wandilla	... W. G. Law. " Thistledown," Gilgandra.
	Whitfield Bros., " Gamble," Binnaway.
Waratah	... Manager, Experiment Farm, Trangie.
	T. W. Abberfield, "Wongo Creek," Alexander Park.
	G. Hand, "Hill View," Narromine.
	Manager, Experiment Farm, Temora.
	S. E. Nash, " Lockwood," *via* Canowindra.
	W. W. Watson, " Woodbine," Tichborne.
	E. J. Johnson, " Iona," Gunningbland.
	A. E. Dixon, " Bramshott," Wallendbeen.
	B. J. Stocks, " Linden Hills," Cunningar.
	E. Idiens, " Kangarooby," Goolagong.
	F. Penfold, " Bluevale," Boggabri.
Yandilla King ...	... Whitfield Bros., "Gamble," Binnaway.
	Manager, Experiment Farm, Temora.
	A E. Dixon, " Bramshott," Wallendbeen.
	S. E. Nash, "Lockwood," via Canowindra.
	B. J. Stocks, " Linden Hills," Cunningar.

Oats—

Algerian	... Manager, Experiment Farm, Temora.
	C. Bennett, Forbes-road, Cowra.
	A. E. Dixon, " Bramshott," Wallendbeen.
	J. Pearce, Mandagery.
	H. E. Ward, " Gwenvale," Parkes.
Belar...	... Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
	D. H. Deering, "Kurralta," Piambra.
	H. E. Ward, "Gwenvale," Parkes.
Buddah	... Manager, Experiment Farm, Trangie.
Gidgee	... Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
Guyra	... H. R. King, " Mangay," Kingsvale.
Lachlan	... Manager, Experiment Farm, Temora.
	A. E. Dixon, " Bramshott," Wallendbeen.
	H. McFadyen, " Lochbine," West Wyalong.
Mulga	... Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
	C. Bennett, Forbes-road, Cowra.
	H. E. Ward, " Gwenvale," Parkes.
	A. Head, " Springwood," Cookamidgera.
	D. H. Deering, " Kurralta," Piambra.
Sunrise	... Manager, Experiment Farm, Trangie.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Wheat Crop-growing Competitions.

SOME FURTHER REPORTS.

Eastern Riverina Districts.

G. C. BARTLETT, H.D.A., Senior Agricultural Instructor.

THE following districts conducted crop competitions during the past season:—Coolamon (twenty-five entries), Wagga, Yerong Creek (sixteen entries), Henty (twelve entries), Culcairn (fifteen entries), Munyabla (twelve entries), Lockhart (twenty-two entries), The Rock (ten entries), Bendabo (thirteen entries), Bidgeemia (thirteen entries), Balldale (eighteen entries), Albury (ten entries), and Corowa (fifteen entries). Wagga held several competitions, including one for the whole farm for crops over 300 acres (twenty-five entries) and one under 300 acres (eight entries). A competition for Junior Farmers, who displayed their crops in a most creditable manner, was also conducted in this district; there were thirteen entries.

The winning crop of the Riverina Championship, conducted under the auspices of the Royal Agricultural Society, was grown in the Albury district by Mr. J. Mathews, of Bulgandra, who won the Albury competition. This crop was awarded the highest marks ever given in any competition so far in New South Wales.

Seasonal Conditions.

The season, except in a small portion of South-eastern Riverina, was a remarkable one, at one time promising good yields and finishing up with disastrous results. Following three dry years, a good season was anticipated and a record area was sown. The break came towards the end of April, giving good sowing conditions in May. An extremely good strike was obtained, with a few exceptions, and there was the promise of a good return. Following the dry conditions prior to sowing there was no reserve of moisture in the subsoil, and good winter rains were looked for to provide the moisture to carry the crops through. The winter, however, was one of the driest on record.

During September high temperatures were experienced, accompanied by strong westerly winds followed by a cold snap and three or four frosts. These conditions did almost irreparable damage, and the break that came in October was too late in the west to revive the crops to anything like normal yields.

The rainfall up to the end of November varied from 8 inches in the west to 16 inches in the eastern portion of the district. In this latter amount were good showers amounting to 3½ inches in August in the Albury-Culcairn-Henty district, which accounts for the remarkable results in those centres compared to districts only 40 miles away.

Cultural Methods.

As a rule early ploughing gives much better results, and June ploughing is generally recommended. However, the past season has shown that discretion has to be used, and that the condition of the land is an important factor to be taken into consideration. Many fallows that were ploughed in a dry state in June did not give as good results as others ploughed in August after rain and in good condition. These latter worked down in a better manner and did not dry out so rapidly. On the other hand, one fallow that was ploughed earlier still—in May—but while the land was still moist after the autumn break, returned approximately 1½ bags per acre more than a neighbouring one ploughed later.

The depth of ploughing that gave the best average results was 4½ inches. Except on the heavy plain country 3 inches did not give such good results.

Those soils that were worked down before harvest demonstrated the advantage of this practice in no uncertain manner. In some cases, where the ploughing was not carried out until fairly late, it was an advantage not to work quite as deeply as where the ploughing had been done early and the land had been given a couple of months' spell, during which time all the rubbish could decompose.

Under the dry summer conditions that prevailed those fallows that had been worked down prior to harvest did not require any further working Those that had not, presented a problem, especially on the heavy lands. In the latter case it was especially important to break them down prior to harvest before they dried out. This was best done with the heavy harrows, the disc, or preferably with a smooger followed by a tined implement.

Most soils gave beneficial results when harrowed after ploughing. This harrowing closes the fallows and prevents evaporation, puts them in a better condition to work, and assists in obtaining a strike of weeds. Where the ploughing was carried out early the harrowing was best deferred until the spring, but where the planting was late it was found best to harrow soon after ploughing.

Dry working should always be avoided. In one case where a fallow was dry-worked it was estimated that four bags per acre, or 30 per cent., was lost through flag smut infection. It has also been demonstrated that dry working induces a much heavier infection of foot-rot and take-all, in addition to causing deterioration of the physical condition of the surface soil.

Sheep are important in fallow management, but considerable discretion has to be used. Fallows that were excessively stocked with sheep, and the working neglected, gave very inferior crops.

It was a season in which late sowing was an advantage. Those farmers who were able to wait for rain and cultivate the fallow prior to sowing achieved better results. This was especially the case on the heavier soils. Yandilla King sown during the first half of May fared best, as it was in a position to respond to the October rains; the other wheats were then too far forward. It was, however, a season of exceptional circumstances, for mid-May sowing with Yandilla King usually results in failure.

Most crops were sown with from 60 to 75 lb. of seed according to the variety. The manuring ranged from 60 to 112 lb. of superphosphate, the majority of crops receiving 80 to 90 lb.

It was found that, under the dry conditions, harrowing after sowing was best deferred until later on in the season, so long as the drill covered satisfactorily. This latter working prevented crusting, caught more weeds, and made a better mulch after the next rain. The heavy soils that were sown dry gave trouble with germination Harrowing improved this, but in some cases the harrowing was deferred too long after rain owing to sowing operations. The results showed that it would have paid to harrow the crop sown, even at the expense of sowing.

Feeding Off.

Feeding off in the western portion of the district gave poor results, while in the east it proved advantageous. Where crops were fed off by a few sheep for days their patchy nature was accentuated. This season fed-off crops received the benefits of the October rains, but these were unusual.

Diseases.

As is usually the case following a dry season, there was more than a desirable amount of flag smut, foot-rot, and take-all present. A general slight infection of rust came late in the season, but the crops were mostly too far forward to suffer to any extent. The winter leaf blight (*Septoria*) was particularly prevalent and it was noticed that Wandilla, Nabawa, Riverina, Gallipoli, and Penny seemed to be particularly affected by it, later showing a weakening of the straw.

The Yields Obtained.

Despite the adverse weather conditions, most districts maintained a high standard of average yield. The yields in the Henty and Albury districts were remarkable. Certainly weather conditions favoured these districts, but the results reflect the high standard of farming adopted. It is noteworthy that every crop in the Henty competition, and all but one in the Albury contest, were up to pure seed standard. Several districts were sadly lacking in the quality of the seed.

The Varieties Used.

The number of varieties used has decreased, but can still be reduced to advantage. In the case of Wagga, thirty-one different varieties were entered. The standard recommended varieties have given the best results year in and out. In all the other districts only nineteen different varieties were seen.

The season was a triumph for Yandilla King under all conditions. Turvey has gone out of favour, especially in the Coolamon district, and has given place to Yandilla King; it still seems to do well, however, on the light brown soils. Federation is rapidly going out of favour.

The winning places were occupied as under:-

VARIETIES Placed.

Variety.	Place.		
	First.	Second.	Third.
Yandilla King	8	2½	7½
Nabawa	2½	4½	2
Marshall's No. 3	1	1	...
Turvey	½	2	3
Waratah	2	½	1
Guinea	...	1	...
Penny...	...	½	...
Gallipoli	...	½	...
Aussie...	...	1	...
Bobin	...	½	...
Duchess	...	½	...
Wandilla	...	...	½

Yandilla King put up a performance unapproached by any other variety, gaining eighteen places, while the next variety, Nabawa, secured nine places, out of a total of forty-two places.

Western Riverina and Yanco.

H. J. DARGIN, Agricultural Instructor.

In the western portion of the Riverina, competitions were conducted by five agricultural societies, viz., Narrandera (twenty-one entries), Deniliquin (twenty-two entries), Berrigan (twelve entries), Clear Hills (Oaklands) (ten entries), and Yanco (fourteen entries). In addition to the dry area competition, the winner of which is eligible to compete in the Royal Agricultural Society's championship competition, the Yanco Society held a competition for crops grown on irrigable land, this being the second of its kind held, the object being to encourage better farming methods under irrigation, for large areas of wheat and other cereals are now being grown as part of the rotation in conjunction with rice. Rice crops have converted thousands of acres of stiff clay loams, which a few years ago were practically useless for growing cereals, into friable soils that are now producing exceptionally heavy crops of wheat and oats for both grain and hay.

The Season.

For the fourth year in succession adverse seasonal conditions were experienced practically throughout these wheat-growing centres. In most cases very little useful rain fell on the fallows, with the result that not a great deal of moisture had been conserved in the subsoils. Rain came during May and June, and although in most cases excellent strikes were obtained with early-sown varieties, they matured considerably later than was intended, as many of the early, mid-season, and late-sown wheats germinated at the same time.

The rainfall for the five districts under review during the period 1st April to the end of October was as follows:—Narrandera 11½ to 12½ inches, Deniliquin 6½ to 7½ inches, Berrigan 8½ to 9½ inches, Oaklands 7½ to 9 inches, Yanco 8 to 9½ inches.

Suitable falls of rain, which supplied sufficient moisture for the immediate requirements of the growing crops, were recorded up till the middle of August; from this time till early October very little rain fell of any value to the fast failing crops, and in all the localities referred to, with the exception of portions of the Narrandera district, the wheat fields received such a severe setback that they never fully recovered, and considerably reduced yields resulted. From 2½ to 3½ inches of rain were recorded during the month of October.

After the October rains a forced, succulent growth took place, and moist, humid conditions caused stem rust to make great headway. These conditions were then replaced by a week to ten days of hot, dry winds, which brought about a rapid haying off of many crops which happened to be in a sappy condition at that particular time, the result being that in many of them the heads contained only small quantities of pinched grain of inferior quality. Heavy rains, accompanied by severe wind storms, set in towards the end of the first week in December, when harvesting was in full swing, and further losses occurred owing to shedding and lodging of crops.

Cultural Details.

The fallows generally were in good condition at time of sowing, although the seed-beds were mostly in a dry state. The majority of farmers did not consider cultivation necessary, other than as a means of assisting in weed control, and the number of times the fallows were worked in the various districts was as follows:—Narrandera 3.1, Deniliquin 3.5, Berrigan 2.4, Oaklands 2.7, Yanco (dry area) 2.2.

While the fallows did not require as much working as is usual in better seasons, greater use was made of sheep, both during the fallowing period and for eating off the growing crops, than has been the case throughout these districts for some years.

The land on which eleven of the fifteen placed entries were grown was ploughed during June and July, the remaining four being ploughed during August. Disc implements were used for breaking up the land in 58 per cent. of the entries—a larger percentage than usual, due, no doubt, to the ploughing operations being rushed, as well as to the hard state of the ground.

Eighteen different varieties were included in the entries. The mid-season variety Nabawa, with twenty-two and a half entries, was the most popular variety, while the late-maturing wheat Yandilla King took second place with nineteen and a half entries. These are the two most favoured wheats grown throughout this part of the Riverina at the present time; both have proved themselves heavy yielders in dry seasons, as well as under favourable conditions, and it is indeed fortunate that two wheats having such outstanding qualities have a different growing period, one being an early-sowing wheat, while the other is a mid-season variety, as this enables farmers to sow a large area of these wheats with a degree of comfort. Federation and Waratah, the two favourite wheats in these parts of the Riverina a few years ago, have lost much of their popularity, the former because of its susceptibility to flag smut and the latter owing to its tendency to shell.

The Varieties Entered.

The following table shows the number of different varieties entered (including the irrigation land at Yanco), and the positions they occupied in this year's crop-growing competitions:—

VARIETIES Entered.

Variety	Total Entries	First	Second	Third
Yandilla King ...	19½	2	2	1
Nabawa	22½	2	...	3
X.B. (Victorian) ...	1	1	...	...
Bobin	1	1	...	...
Ranee	5	..	1	...
Riverina	1	...	1	...
Cleveland	1	...	1	...
Bomen	1	...	1	...
Federation	9	...	...	1
Waratah	6	...	...	1
Penny	4	...	...	...
Free Gallipoli ...	3	...	...	...
Turvey	2	...	...	...
Bena	1	...	...	...
Marshall's No. 3 ...	½	...	...	...
Major	½	...	...	...
Exquisite	½	...	...	...
Yanward	½	...	...	...

The Seed Used.

Of the crops inspected this year, more than twice as many as last year scored sufficient points for trueness to type and purity to indicate that they were up to pure seed standard, while in a great many other cases the seed was quite satisfactory, though just below pure seed requirements.

In every instance the seed had been graded—incidentally this was where some of it became mixed with other varieties—and, with the exception of one crop, the seed had been treated with copper carbonate for the prevention of bunt.

The following table shows the various amounts of seed used by competitors:—

QUANTITIES of Seed Used.

District.	Seed per acre				Total Number of Entries.
	50-56 lb	60-65 lb	70-75 lb	80-85 lb	
	Competitors	Competitors.	Competitors.	Competitors.	Competitors.
Narrandera . ..	3	10	6	2	21
Deniliquin	2	11	9	...	22
Berrigan	..	6	6	. .	12
Oaklands . . .		4	6	...	10
Yanco .		11	1	2	14
Total .	5	42	28	4	79

The rate of seeding adopted by the growers of the eighteen placed crops in the competitions were – Seven at the rate of 60-65 lb per acre; nine at the rate of 70-75 lb. per acre; and two at the rate of 80 85 lb. per acre.

Quantities of Superphosphate.

The following table shows the number of crops to which various quantities of superphosphate were applied per acre in each of the districts:—

District	Superphosphate per acre						Total Number of Entries.
	45 lb	50-56 lb	60-65 lb	70 75 lb	80-85 lb	90-100 lb	
Narrandera . .	...	4	5	3	7	2	21
Deniliquin .	1	4	9	3	5	...	22
Berrigan . ..	...	1	7	4	...	...	12
Oaklands	...	...	4	2	3	1	10
Yanco	. .	...	10	4	...	.	14
Total . .	1	9	35	16	15	3	79

The percentage of the competitors using 70 lb. per acre and upwards dropped this year to 43 per cent. The farmers fully realise the benefits obtained from such applications, particularly on well-conditioned fallows. Owing to dry weather, however, the fallows generally were not in as good condition as was desired at time of sowing; the financial position of many farmers is not what it was, while a great deal of uncertainty existed regarding both weather conditions and market prices.

Diseases and Weeds.

A number of crops seen were badly affected by foot-rot, while in several take-all had caused some damage. Loose smut was again found in a number of crops, but not to any extent, while not a trace of bunt was seen in any of the districts visited.

Owing to the warm, humid conditions which prevailed during the latter part of the growing period, stem rust made its appearance and spread rapidly, playing havoc with a number of crops which had not quite matured, and heavy losses were sustained, more particularly throughout the Yanco Irrigation Area.

Flag smut was not nearly so prevalent as during the previous few years, owing principally to the farmers having grown large areas of the highly resistant variety Nabawa. In the Deniliquin district, where this fungous disease has been rampant in past years, the farmers have made a special effort to free their fields of this fungus and a remarkable improvement was noted this year.

On some of the old cultivation land wild oats, saffron thistle and wild mustard were found in large quantities, while a little Paterson's curse, cockspur, and barley grass were found slightly affecting the yields of a few crops.

The Temora District.

L. JUDD, H.D.A., Manager, Temora Experiment Farm, and District Instructor.

Competitions were conducted in this district at the following centres:—Temora, Quandialla, Bribbaree, Barmedman, and Dirnaseer, the total number of entries being ninety-five.

The season proved far from ideal for the production of cereals. The absence of good soaking winter rains left the soil without a suitable reserve to tide over the spring months, which proved dry. Many crops were badly affected by the protracted dry spell. Good rains were experienced over most of the district during October, but in places the falls were too late for the crops to receive full benefit.

The Varieties.

The competitions proved a triumph for Yandilla King. This variety secured first place in the open competitions at Temora, Quandialla, and Dirnaseer, and first place in the combined competitions at Bribbaree and Quandialla.

Fourteen different varieties were entered in the competitions, the number of entries of each being as follows:—Yandilla King 34, Nabawa 32, Waratah 19, Marshall's No. 3 10, Duri 6, Bena 4, Turvey 3, Penny 2, Union 2, and Federation, Canberra, Exquisite, and Bobin 1 each.

The remarkable performances, over a period of years, of Yandilla King have established it as a most suitable late maturing variety for average conditions throughout the district. Its heavy-yielding ability, coupled with its adaptability, drought-resistance, and natural vigour have been responsible for its yearly increase in acreage in this district. No variety under cultivation will respond so readily to good conditions. Cases

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of unsatisfactory performance of this variety can usually be traced to the sowing having been made too late in the season; early sowing is essential for maximum performance.

Nabawa has rapidly risen to favour, both in competitions and in general cultivation, throughout the district; its drought-resistance and heavy yielding ability, coupled with its almost total resistance to flag smut, have made it a valuable variety and definitely assured its position in cropping routine.

The popularity of Waratah is waning. The ravages of flag smut, coupled with unsuitable seasonable conditions, have been largely responsible for its decline.

On portion of the Bland comprising heavy clay land, the variety Duri has been reputed to have given superior performances to Waratah over a period of years, but this applies to a definite set of peculiar local conditions and can by no means be taken as general to the district.

Penny secured pride of place in the Barmedman competition, and this variety has a definite use in this part of the district, particularly on the lighter class of country.

Marshall's No. 3 is a popular variety on the eastern side of the district, but Yandilla King will be found to give a superior all-round performance, although possibly no great increase in yield over Marshall's No. 3.

The dry winter and flag smut infection have been responsible for the decline in area devoted to Union. On heavy clay country, where a definite oat rotation is a feature of cropping practice, Union still has a definite place as a mid-season variety, as it is distinctly a good farmer's variety.

The Seed and its Treatment.

Dry treatment of the seed was adopted by all competitors. Bunt was found in some crops, due, no doubt, to insufficient or faulty dusting.

Generally speaking, the standard of the seed was satisfactory. There is still room for improvement, however, and the policy of sowing a plot of pedigree seed adjacent to the bulk sowing of the same variety is to be recommended. Harvesting the bulk area first and cleaning the machine before stripping the pedigree plot insures the minimum of admixture. Care should be taken to rogue the stud plot before harvesting. This policy is regularly adopted by Messrs. Maguire and Fehon at Barmedman, and the results of their efforts are reflected in the exceptionally high standard of purity which characterised their entry.

In practically every case the rate of seeding of winning entries was 60 lb. per acre. This quantity can be safely adopted as a standard for late maturing and mid-season varieties, with an increase of 5 to 10 lb. per acre for early-maturing varieties, particularly if sowing is delayed for any reason.

Manuring.

The rate of application of superphosphate varied from 56 lb. to 112 lb. per acre, which one would expect in a district possessing such a diversity of soil and climatic conditions. The heavier applications were found the most satisfactory in the south-eastern portion of the district, particularly around Sebastopol and Marinna, whilst the lighter applications proved most satisfactory on the heavier Bland country, 56 to 84 lb. per acre being the usual application, varying according to the age of the land and the quality of the fallow.

Weeds and Diseases.

Flag smut is still taking a heavy toll, and with the exception of Nabawa all crops showed infection. Loose smut is certainly deserving of attention, and farmers are strongly advised to give more attention to seed selection and production. The adoption of stud seed plots should certainly find a place in the farm practice. Foot rot and take-all were more prevalent this year, and in some cases severe enough to warrant attention being given to oat rotation. Rust was present, but insufficient to cause damage except in very isolated cases.

Numerous crops showed a heavy infestation with black oats, the trouble being accentuated no doubt by dry sowing and meagre rainfall on the fallow. A fodder crop would amply repay on the most heavily infested areas.

Skeleton weed is gradually spreading, and farmers should familiarise themselves with this weed with a view of eradication in the early stages

Cultural Methods.

The advantages of early preparation of the fallow were again emphasised in the competitions. For the preparation of the fallow the mouldboard plough proved the most popular implement, followed by the use of the springtooth cultivator for spring and autumn workings.

The rigid tine scarifier is increasing in popularity, and its more general use in the final stages of cultivation can be looked for in the future.

POTATO FERTILISER EXPERIMENTS AT GRAFTON.

MANURIAL experiments with potatoes were continued last year at Grafton Experiment Farm, under the supervision of Mr. H. A. Grantham, Experimentalist.

Varying amounts of superphosphate and fertiliser mixtures were tried out in comparison with unmanured plots, and although increased yields were obtained in a number of instances, only in the case of the plot fertilised with a mixture of 280 lb. superphosphate and 93 lb. sulphate of potash per acre did the increased returns more than defray the cost of the fertiliser. The increased yield due to the fertiliser was 19 cwt. 2 qrs. 19 lb., valued at £7 17s. 7d., while the cost of the fertiliser was £1 12s. 4d., leaving a net profit of £6 5s. 3d. per acre.

Although the dry conditions operated against the best results being obtained from the heavier applications under trial, it is noteworthy that the mixture which showed up best last year has given consistently good results ever since its inclusion in these trials in 1927.

Coastal Winter Fodder Trials, 1930.

The South Coast Trials.

R. N. MAKIN, Senior Agricultural Instructor.

EXPERIMENTS were carried out on farmers' properties at nine different centres on the South Coast last season to demonstrate the most suitable varieties of wheat and oats for winter fodders. Vetches were also grown in combination with Gresley wheat and with Sunrise oats.

Three of the nine experiment plots failed, chiefly on account of the unfavourable weather conditions. Seed was sown broadcast at 2 bushels per acre, except in the case of the Castlereagh plot, where seed at the rate of 60 lb. per acre was sown by means of a wheat drill. Superphosphate was applied to all plots at the rate of about 2 cwt. per acre. The land was ploughed and harrowed and the seed and fertiliser harrowed in.

Where it could be arranged, the crops were cut at their most succulent stage. The extra trouble involved in harvesting the crops in which the vetches had made satisfactory growth was considered worth while, as the vetch is a valuable addition to wheat or oats for green fodder.

The yields of the different plots were as follows:—

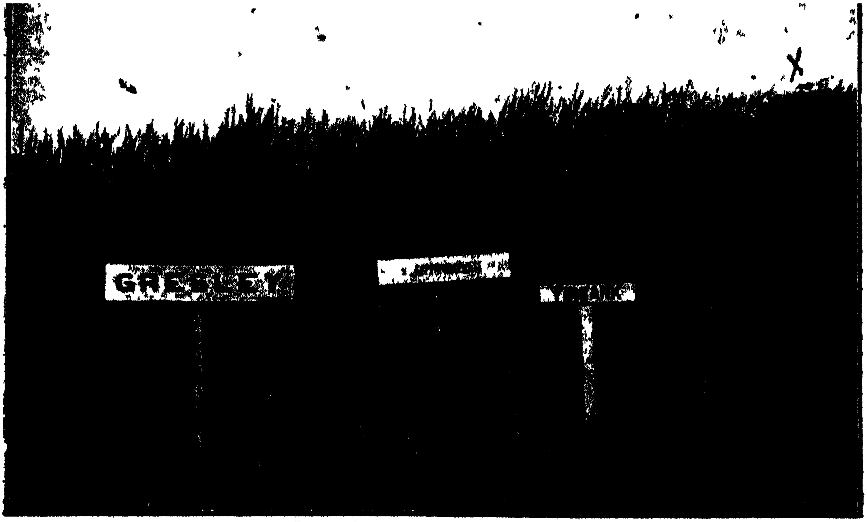
YIELDS in South Coast Winter Fodder Trials, 1930.

	Castlereagh (W. W. Stanton).		Campbelltown (A. Scattergood).		Camden (J. W. Childs)		Kangaroo Valley (A. Chittick)		Numba-Nowra (A. Mottram)		Gerringong (C. T. Hindmarsh)	
	Date Harvested	Yield.	Date Harvested.	Yield	Date Harvested.	Yield.	Date Harvested.	Yield	Date Harvested	Yield	Date Harvested.	Yield.
		t. c.		t. c.		t. c.		t. c.		t. c.		t. c.
Florence Wheat.	17 Sep	6 10	11 Sep	4 2	4 Aug	12 0	10 July	7 17	25 Aug.	13 1	5 Sep.	5 8
Firbank Wheat.	17 ,,	6 4	11 ,,	3 13	20 ,,	12 11	10 ,,	6 18	25 ,,	12 1	5 ,,	6 5
Gresley Wheat ..	24 ,,	8 5	24 ,,	3 17	0 Sep	13 14	19 Aug	6 11	25 ,,	17 1	5 ,,	6 17
Gresley Wheat & Vetches.	24 ,,	9 12	24 ,,	4 2	0 ,,	13 8	19 ,,	8 18	25 ,,	17 9	5 ,,	10 8
Buddah Oats ...	29 ,,	8 17	24 ,,	4 18	20 Aug.	14 11	19 ,,	12 0	2 Sep.	13 8	5 ,,	9 17
Mulga Oats ...	29 ,,	8 0	30 ,,	4 10	20 Sep.	14 5	6 Sep	8 5	2 ,,	9 13	5 ,,	7 17
Sunrise Oats ...	29 ,,	10 15	24 ,,	4 2	9 ,,	12 0	6 ,,	9 4	2 ,,	11 5	19 ,,	7 5
Sunrise Oats and Vetches.	29 ,,	12 3	24 ,,	5 12	9 ,,	14 17	6 ,,	9 1	2 ,,	14 9	19 ,,	8 17
Algerian Oats ...	20 Oct.	10 0	20 Oct.	3 0	25 ,,	16 17	3 Oct	10 9	2 ,,	14 17	2 Oct.	9 5
College Algerian Oats.	...	..	20 ,,	2 18	25 ,,	16 5	3 ,,	10 0	2 ,,	19 13	.	...
Date of Sowing	14th and 15th May.		6th May.		12th April.		22nd March		5th April		10th April.	

College Algerian oats was tried for the first time in these trials, and only in one instance did it outyield the better-known Algerian. However, the claim made for College Algerian, that it makes better early growth than Algerian, seems to have been borne out in these experiments.

This year satisfactory increases were obtained in several instances when vetches were sown in combination with cereals, and it would appear that past failures have been due to the absence in the soil of the particular bacteria which favour the growth of this legume.

Mr. W. W. Stanton's Oat Plots at Castlereagh, Penrith.



Mr. J. W. Child's Wheat Plots at Camden.

The wheat varieties under trial again demonstrated their suitability for coastal conditions, while the dry conditions helped to keep rust from becoming troublesome.

Buddah has proved its value over a number of years as an early variety of oats for cutting for green fodder, and would be more largely grown by South Coast dairy farmers if seed supplies were more readily available. Growers of Buddah oats seed in other parts of the State would do well to give some attention to supplying this demand. Mulga, Sunrise, and Algerian oats are also still in demand, having proved their worth as green fodder varieties.

The Far South Coast Trials.

JOHN L. GREEN, H.D.A., Agricultural Instructor.

The suitability of different varieties of wheat, oats, and barley for winter fodders was tested again last year on farmers' experiment plots. Fertiliser trials were also carried out.

A very dry autumn was responsible in many instances for a poor germination of the seed when sown broadcast. The Bega, Bemboka, and Candelo plots were sown with a drill, and, except at Moruya, superphosphate was sown with the seed on all plots. The winter and spring seasons were very favourable.

All plots were harvested as near as practicable to the flowering stage. Algerian and College Algerian oats, which are late maturers, were, however, taken off a little previous to that stage.

The yields in the variety trials were as follows:—

YIELDS in the Variety Trials.

	Moruya (L. D. Collett).	Bega (T. E W. Irwin).	Bemboka (W. C. Wilton).	Candelo (E. H. Filmer).
Wheat—	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Florence	1 13 2	1 16 0	....	....
Gresley	1 17 2	3 3 3	4 6 0	....
Clarendon	....	....	3 8 0	....
Barley—				
Skinless	18 0	3 0 2	4 11 0	....
Oats—				
Algerian	3 5 0	8 1 1	4 16 0	7 0 3
College Algerian	2 15 2	5 4 2	4 14 0	5 7 2
Guyra	3 2 1	9 2 3	4 14 0	5 14 1
Mulga	2 2 0	5 6 1	4 10 0	4 7 1
Buddah	2 4 0	5 4 3	4 18 0	3 11 2
Sunrise	....	....	4 18 0	....
Date sown	8th April	31st March	16th June	3rd March.
Date harvested	16th October	3rd September	30th October	18th November

Experiments over a number of years and on a variety of soils have proved Algerian to be the best variety of oats. It is the most suitable variety for grazing, being fine and palatable, while its early spreading habit and excellent stooling qualities make for a good sole. Moreover, after being grazed and allowed to grow for a cut of hay it gives a much heavier yield than any other variety.

Guyra, which is a little earlier than Algerian, is inferior to that variety under most conditions, although in the Cobargo district Guyra has given as good results as Algerian. Guyra in a number of trials has come away very well and been most promising, but has failed to sustain this early promise. It would appear to be not as hardy a variety as Algerian on the hill granite soils of this district.

Of the quick-maturing varieties, Mulga, Buddah, Sunrise, and Gidgee, there would appear to be little choice, although Gidgee, which was not included in this season's trials owing to its susceptibility to rust, has given the best results to date. These early varieties will not stand grazing like Algerian and then produce a satisfactory hay crop. Undoubtedly there is a place for them in the farming practice of this district, as, owing to their quick early growth, they are most suited to early sowing in order to obtain winter grazing, or, better still, to cut and feed green to stock during the winter months.

A variety of oats included for the first time this season was College Algerian, which came from Tasmania with the reputation of being as good a yielder as our Algerian and slightly earlier in maturity. These claims have not been borne out by trials in this district, where the yield has been less and the maturity later than Algerian. However, it is undoubtedly superior to Algerian as regards fineness of growth and stooling ability.

The results of the winter green fodder fertiliser trials at Bemboka and Candelo are given in the following table. Algerian oats was the crop used in these trials, and the effect of the superphosphate on the Bemboka plot was evident right from the start.

YIELDS in the Manurial Trials.

Fertiliser	Bemboka			Candelo		
	tons.	cwt.	qrs.	tons	cwt.	qrs.
Superphosphate (1 cwt. per acre) ...	3	1	0		...	
„ (2 cwt. per acre) ...	3	15	0	3	7	0
M22 (2 cwt. per acre)	4	16	0	3	9	1
Basic superphosphate (2 cwt. per acre).	2	17	0	3	11	2
No Manure	2	11	2	3	3	3

The Upper North Coast Trials.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

Winter green fodder trials on farmers' properties were carried out at Murwillumbah (Messrs. McIlrath and Woods), Woodford Dale (Mr. R. Munro), Raleigh (Mr. M. McBaron), Coramba (Mr. M. D. O'Connell), and Mullumbimby (Mr. C. H. Taylor). The harvest results were obtained only in the case of the three plots first mentioned, the yields of which are shown in the following table. The Murwillumbah and Woodford Dale plots were sown on 9th and 7th April respectively, while the Raleigh plot was not sown till 28th May, owing to wet weather. Superphosphate at the rate of 2 cwt. per acre was used on all plots.

YIELDS in the Variety Trials, 1930.

Variety.	Murwillumbah.		Woodford Vale.		Raleigh.	
	Date harvested.	Yield per acre.	Date harvested.	Yield per acre.	Date harvested.	Yield per acre.
		t. cwt. q.		t. cwt. q.		t. cwt. q.
Clarendon Wheat	16 July	10 1 2	10 July	15 0 0	...	...
Gresley Wheat	13 Aug.	10 5 2	... .	...	...	. .
Buddah Oats	13 „	12 15 3	5 Aug.	13 10 0	...	...
Sunrise Oats	13 „	10 1 2	...	...	...	...
College Algerian Oats	...	...	...	...	24 Oct.	8 0 0
Algerian Oats	...	...	...	...	24 „	6 8 2
1 part Clarendon Wheat, 1 part Buddah Oats, Field Peas, and Vetches.	13 Aug.	12 2 3	5 Aug.	13 11 3	...	...
1 part Clarendon Wheat, 3 parts Buddah Oats, Field Peas, and Vetches.	13 „	13 17 1	5 „	13 5 3	...	...
1 part Gresley Wheat, 3 parts Sunrise Oats, Field Peas, and Vetches.	13 „	11 1 2	...	...	...	...
Black Winter Rye	16 July	9 17 3	10 July	9 5 3	...	...

With such unfavourable weather conditions as prevailed during the late autumn and early winter the results may be regarded as very satisfactory. Clarendon wheat has again done well. Gresley gave better results this year than previously, and appeared to stand the wet conditions slightly better than Clarendon. Buddah oats again outyielded Sunrise, and the quality of the fodder produced was also better. Buddah was the least affected of all the plots by the continuous rains. Algerian did not do well this season, being seriously checked during the early stages of growth by the wet conditions. At Raleigh, the only centre where the late varieties were harvested, College Algerian, a new variety tested in this district for the first time, though affected, like Algerian, by the wet weather, gave better results than that variety.

In the plots in which combinations of cereals were used the only conclusion that can be drawn this season is that Gresley would be a better wheat than Clarendon to sow in combination with Buddah oats, the last-named wheat being too early for this purpose. The Woolly-podded vetch made excellent growth, withstanding the wet conditions very well. At Woodford Dale this was most striking, areas of other kinds of vetches in the district dying out during the wet weather, whilst this variety grew vigorously. The Dun field peas, on the other hand, made only poor growth.

In the fertiliser trials with winter fodders at Murwillumbah and Woodford Dale no advantage was gained from an application of 2 cwt. superphosphate per acre to plots of Clarendon wheat, although at Raleigh the same quantity of fertiliser applied to Algerian oats resulted in a yield of 6 tons 8 cwt. 2 qrs. per acre, as compared with 4 tons 2 cwt. 2 qrs. from an unmanured area.

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with the view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected orange buds to nurserymen during the 1930 budding season, trees from which should be available for planting during the 1931 planting season:—

	Buds of Washington Navel.	Buds of Late Valencia.
T. Adamson, Ermington	3,000	3,000
W. Beck, Epping...	1,000	1,000
A. T. Eyles, Rydalmere	3,000	2,000
J. de Freitas, Fairfield	200	200
R. Hughes, Ermington	1,000	1,000
L. P. Rosen and Son, Carlingford	5,000	1,200
B. E. Yarnall, Ourimbah	100	100

—C. G. SAVAGE, Director of Fruit Culture.

SOW WHEAT AT THE CORRECT DEPTH.

IF the maximum results are to be obtained from the wheat crop the seed must be sown to the correct depth. In the ideal seed bed it should be sown not deeper than 2 inches, in the fine, compacted sub-surface soil, where it can draw upon the moisture in the subsoil. If the seed bed is dry at that depth, but moisture is available up to, say, 3 inches, the depth of sowing must be proportionately increased.

Tomato Crop Competitions, 1930.

CENTRAL NORTH COAST.

A. J. PINN, H.D.A., Special Agricultural Instructor.*

THE executive association of the tomato-growers of the Central North Coast districts from Eungai to Coff's Harbour conducted a tomato crop competition in which prizes to the value of 20 guineas were distributed.

Thirty-three plots were submitted to the judge at the time of the first inspection during the first week in October, but three withdrew before the final judging during the first week in November. The scale of points used in judging is shown in the accompanying table of awards. Yields were estimated on the quantities in sight (eliminating all grub infested fruit) on and up to the time of final inspection, and are not necessarily true indications of the total yields. In this respect early maturing crops gained an advantage, but as the district is particularly suitable for early tomatoes, it was for this reason that early judging was carried out.

Rainfall and Irrigation.

Up to the time of judging the rainfall throughout the district was generally fairly satisfactory, but some areas were more fortunate than others in receiving the benefits of isolated showers. Since judging, very dry conditions have prevailed, and the anticipated output of the district has as a consequence been greatly curtailed.

Throughout this district there are areas where irrigation could be practised, and those close to small streams would be well advised to adopt the suggestion, as any outlay on plant would be quickly repaid by bigger yields. When spray irrigation is practised it is advisable to water only during such weather as favours the evaporation of surplus moisture from the foliage, otherwise the risk of disease is great.

Methods Employed by Successful Competitors.

Mr. E. L. Snodgrass entered an area of Bonny Best variety grown on stakes and pruned to a single stem. The area submitted (1 acre) was portion of a block of 11,000 plants similarly treated. The soil was a clay loam, once cropped—the previous season—to tomatoes. First ploughing was carried out in May to a depth of about 5 inches, and the plot was limed and harrowed. Two additional ploughings and three harrowings were given before the plants were set out.

Seed was sown during May and June, and young plants transplanted into boxes and raised under cover. Whilst in the seed frames regular sprayings of Bordeaux mixture and "Black Leaf 40" were given. Transplanting to the field took place at the end of July and early August, in rows approximately 4 feet apart with plants 2 feet apart in the row.

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* Mr. Pinn judged this competition.

TOMATO Crop Competition—Central North Coast, 1930.

Competitor	Locality.	Variety.	Plants per acre.	Date Planted.	Yield Per Acre to 1st week November.	Points Awarded.						Remarks.
						Yield. (Maximum 50 points.)	Quality. (Maximum 20 points.)	Purity of Type (Maximum 10 points.)	Freedom from Disease. (Maximum 10 points.)	Cultivation. (Maximum 10 points.)	Total. (Maximum 100 points.)	
					half cases.							
E. L. Snodgrass ...	Boambee	Bonny Best	5.377	End July	671	50	19	9	7	9½	94½	Staked.
W. A. Robinson ...	North Boambee ...	Bonny Best, Chalk's Early Jewel, Marglobe	4,862	7th August ...	499	37	19	9	9	10	84	Staked.
A. J. Rowe	Macksville ...	Early Pride	3,989	End July	465	34½	18	10	8½	9	80	. . ..
Robt. Beer	Nambucca Heads...	Early Pride, Early Winner First and Best.	2.739	21-31 July .	404	30	17½	9	8	7	71½	.. ..
J. K. Thompson ...	Valla	Early Pride, Earliana ...	2,768	20-25 July ..	352	26	16	10	9	8	69	....
Wilfred Knobbs ...	„	Earliana, Bonny Best . .	1,250	1, 2 & 12 August...	286	21½	18	10	9	10	68½	....
N. Ellis	Nambucca Heads...	Marglobe, Chalk's Early Jewel, Repeater, &c.	4,253 Staked 4,797 bush	Early August ...	398	29½	17½	5	7	9	68	Mostly staked.
J. K. Thompson ...	Valla	Early Pride, Earliana ...	2.562	30 July	288	21½	16	10	9	9½	66	....
W. J. Knobbs ...	„	Earliana	1,158	6-8 August (under cover).	208	15½	17½	10	9	9½	61½	....
J. R. G. England ...	„	„	2,349	25 August ...	196	14½	18	10	9	10	61½	....
O. Tacon and D. Thompson.	„	Chalk's Early Jewel, Early Pride, Repeater, Burwood Prize.	3,630	30 July	244	18	18	9	8	8½	61½	....
R. Thompson	Urunga	Early Pride, Earliana ...	3,974	27 July	252	19	16	9	7	9½	60½	....
W. N. MacDougall ...	Bungal Creek ...	Pink Queen, Chalk's Early Jewel, Denisonia.	2,682	9-16 August ...	150	11	19	9½	10	10	59½	....
F. Adler	Nambucca Heads...	Earliana, Harbinger, Matchless.	3,413	14 August . .	203	15	17½	9½	8½	8½	59	....

TOMATO Crop Competition—Central North Coast, 1930—*continued.*

Competitor.	Locality.	Variety.	Plants Per acre.	Date Planted.	Yield per acre to 1st week November.	Points Awarded.						Remarks.
						Yield. (Maximum 50 points.)	Quality. (Maximum 20 points.)	Purity of Type. (Maximum 10 points.)	Freedom from Disease. (Maximum 10 points.)	Cultivation. (Maximum 10 points).	Total. (Maximum 100 points.)	
					half cases.							
R. A. Grant	North Boambee	Chalk's Early Jewel, Earliana	4,052	26 July, 20 August	319	23½	17	6	4	7	57½	....
A. J. Rowe	Macksville	Marglobe, Harbinger, Early Pride.	3,989	Mid August	182	13½	18	9½	8	8	57	....
Milton Henderson	Valla	Earliana	1,692	Early August	135	10	17½	9	10	10	56½	....
R. Thompson	Urunga	Marglobe, Norton	3,515	7 August	102	7½	20	10	9	9½	56	....
W. A. Robinson	North Boambee	Bonny Best	2,178	Mid August	170	12½	18½	8	8	9	56	....
A. Thompson	Nambucca	Chalk's Early Jewel, Early Pride.	2,562	6 August	136	10	19	9	9½	8	55½	....
J. H. C. Tutt	Valla	Early Pride	2,515	Early August	181	13½	16	9½	6	9½	54½	....
A. C. Wallace	Macksville	Earliana	1,713	10 July	265	20	16	9	3	5	53	....
H. W. Kirkland	Fernmount	Marglobe, Early Pride, Bonny Best.	3,508	Early September	152	11½	18	6	9	8	52½	....
H. W. Kirkland	„	„ „	3,508	Early September	150	11	18	6	9	8	52	....
C. J. Buchanan	Valla	Marglobe, Pink Queen, Earliana	2,433	1-4 September	104	7½	18	8	8½	10	52	....
J. R. G. England	„	Earliana	2,004	5 September	99	7½	18	9½	7	10	52	....
W. J. Robinson & Son	Boambee	Chalk's Early Jewel, Earliana.	3,300	20 August	146	11	18	8	6	8	51	....
A. Marshall	Urunga Island	Marglobe, Norton, Bonny Best.	3,570	1-14 August	79	6	19	8	9	8½	50½	....
G. Wyatt	Valla	Earliwinner, First and Best, Marglobe.	1,602	9 September	31	2½	18	9½	10	10	50	....
G. Provost	Eungai Creek	Pink Queen, Chalk's Early Jewel, Earliana.	2,722	July and August	136	10	16	5	8	10	49	....

Before planting the land was fertilised with a mixture of superphosphate and blood and bone, at the rate of 13 cwt. per acre and during the growing period after the first fruit had set, an application of 60 lb. of sulphate of ammonia per acre.

Up to final judging, five dustings were given with a dust containing arsenate of lead 50 per cent., copper carbonate 8 per cent., and sulphur 40 per cent.

Cultivation was regular and left little to be desired. Irrigation was carried out as required.

Mr. E. L. Snodgrass' Winning Crop.

Points were lost for a mild infection of stem-girdle, but as the yield of 671 half cases indicates, little actual loss resulted. Mr. Snodgrass' first consignment reached Sydney market on 15th October, and over 2,000 half cases had been marketed off the whole area to mid-December.

Mr. W. A. Robinson, who secured second prize with one entry, has been a keen grower of tomatoes for a number of years, but usually has devoted his attentions to the bush method of culture. The crop which secured him the second prize was staked and pruned to single stems and comprised chiefly Bonny Best and Chalk's Early Jewel, with a few rows of Marglobe. The soil was a good quality loam, which had been under cultivation for eight years. The previous crop was also tomatoes. First ploughing was

ESTABLISHMENT of PASTURES

The young plants during root establishment cannot forage to any extent for plant food. It is therefore essential when seeding a pasture to use a balanced mixture of readily available fertiliser. When the clovers become established, they are able to fix their own nitrogen and require phosphate applications only. The grasses, however, become nitrogen starved during the cold months and show little growth unless supplied with this plant food. Consequently, for the production of a good "soil cover," the exclusion of weeds, and a balance between grasses and clovers, newly sown pastures should be fertilised as follows:—

A—IN AUTUMN AT SEEDING—
2 to 3 cwts. super per acre.
1 to 2 cwts. sulphate of ammonia per acre.

B—IN JULY—
1 to 1½ cwts. sulphate of ammonia per acre.

Applications of nitrogen will, in addition, provide valuable Winter and early Spring feed.

For further particulars apply

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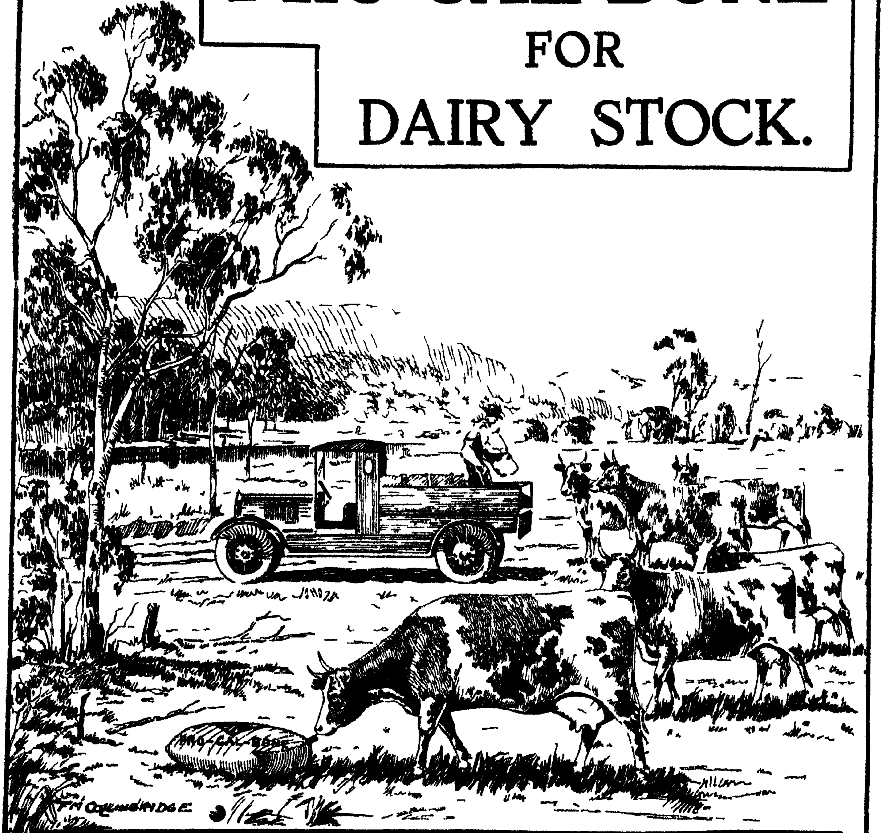

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Write for Booklet:—

METROPOLITAN MEAT INDUSTRY BOARD,
State Abattoir, Homebush Bay, N.S.W.

given in mid-July to a depth of 6 inches, and the after-cultivation consisted of a harrowing, a springtooth cultivation, a second ploughing, after which the land was again springtoothed. Planting lines were then drilled and fertiliser worked in and covered with a scuffler. Fertiliser was applied at the rate of 5 cwt. per acre and consisted of superphosphate alone on portion and on the rest superphosphate and blood and bone.

Seed was sown on 16th June, and plants were mostly raised under cover. Whilst in the seed beds the plants were dusted occasionally with a proprietary mixture containing copper carbonate and sulphur. Transplanting commenced on 7th August, and plants were sprayed with Bordeaux mixture one week after setting out, and then dusted every ten days with a similar dust to that used in seed bed, together with a nicotine dust. Plants were set out in rows 4 feet apart and approximately 2½ feet apart in the row.

Mr. W. A. Robinson's Crop.

Cultivation was excellent throughout. The crop was irrigated as conditions demanded. The growth on Mr. Robinson's plot was more uniform than on Mr. Snodgrass' entry, but the latter had the advantage in yield through earlier planting. From the staked area of approximately 1½ acres, which embraced the second prize plot, over 1,200 half cases had been marketed to mid-December.

Mr. A. J. Rowe, of Macksville, secured third prize with a crop grown on the bush system and without irrigation. The variety was Early Pride, and plants were set relatively close for this method of cropping, being in rows approximately 4 feet 2½ inches apart and 2 feet 7 inches apart in the rows. The plot was situated on a hillside with northerly aspect, and the soil was a medium loam. The first ploughing was given in May, and the plot received two re-ploughings and several harrowings before planting. The variety was Early Pride and seed was sown in May. Plants were raised in the open, but received six sprayings with Bordeaux mixture during the time they were in the seed bed. Transplanting took place at the end of July. Fertiliser consisted of 3 cwt. superphosphate per acre. No fungicide sprayings took place in the field, but arsenate of lead was used in the first week of October and later to control grubs. An excellent crown bunch set was obtained, due no doubt to the favourable hillside position. The large number of plants per acre gained for Mr. Rowe a high yield of early fruit. Cultivation during first inspection was considerably improved upon before the second inspection, largely as the result of hand hoeing.

In all three cases the fruit was of good quality.

Systems of Culture.

The result of the competition indicates the many advantages of the system of cultivation of growing on stakes and pruning to a single stem. It should, of course, be borne in mind that this system entails a good deal more hand labour, but notwithstanding this, it appears worth while. For satisfactory results it is desirable that a water supply be available.

It is of interest that on Mr. W. A. Robinson's farm, where areas were planted to each system, that the staked tomatoes up to judging produced twice the marketable quantity of the bush area, although the latter was approximately six times the area.

Pruning and staking results in much earlier fruit, which in itself is usually a big factor in better prices.

Diseases and Prevention.

It was apparent that many growers failed to raise healthy plants through lack of care in the seedling stage, and had to purchase from other growers. Almost half the plots (fourteen) contained plants which had been purchased or else received no recognised treatment for disease prevention. The raising of plants in the open in the winter is courting trouble, for the drop in the temperature at night almost invariably results in the formation of dew. This continual wetting, in addition to that from rain, favours the development of many of the worst tomato diseases.

The successful raising of early plants is the most important phase of tomato production in the Central North Coast, and raising the plants under cover is the first essential. It is pleasing to note an increase in the number of growers who now raise their own plants in this way.

Young plants should also be given ample room for development—spaced 4 inches x 3 inches apart in the frames so that light and air may play their part in strengthening the plants and enabling them to resist infection, and making it possible for sprays and dusts to cover each part and afford protection.

To prevent disease it is advisable to spray the young plants regularly with Bordeaux mixture—while in the seed-bed half-strength is sufficient. The brands of Bordeaux powder specially prepared for making spray should be used, and not the dusting powder of the same name. When making home-made Bordeaux good quicklime is essential, and in any case it is advisable to test with litmus paper for acidity.

Frequent dustings of the young plants in the seed-bed may be adopted in place of sprayings, but cannot be recommended pending further experience. There are indications that dusts containing monohydrated copper sulphate may replace those containing copper carbonate for use in the field.

It is pleasing to record that not one case of spotted wilt was observed. Growers should take every possible care that this virus disease, carried by the black carnation thrip, is not introduced to the district, and it is desirable that no plants be obtained from districts further south where the disease is present.

Another new trouble, often referred to as rust, but which is caused by a small mite, has made its appearance in the district. Dusting with sulphur or spraying with lime-sulphur will control it, and growers should be ready to treat it as soon as it is noticed.

The tomato fruit caterpillar, also known as the corn ear worm and cotton boll worm, is common in the district. All the growers are acquainted with the method of control by spraying or dusting with arsenate of lead, but in many cases the treatment was not commenced early enough. Growers should concentrate on the destruction of the early brood, and give more attention to dusting the lateral growths of the plants.

Fusarium wilt, better known as sleeping sickness, was observed in several plots. Continual cropping on the same land encourages its rapid spread, and so the use of new land for the seed-bed is advisable. There are a number of varieties which are highly resistant to this trouble; Marglobe showed out well in this respect on several farms.

Distance of Planting.

It will be noted that there was a wide range in the distances apart the plants were set out. The highest number of plants, viz., 5,377 per acre, was on Mr. Snodgrass' staked plot, but on several of the areas planted under the bush method very close planting was adopted, as in the case in the small area which went to make up part of Mr. Ellis's plot. In this case the planting was at the rate of 4,797 plants per acre, approximately 4 feet by 2¼ feet. At the other end of the scale was Mr. W. J. Knobb's plot with only 1,158 plants per acre, which represented distances a little in excess of 6 feet 6 inches by 5 feet 9 inches.

The average acre planting of all the original entries was 3,006 plants, equivalent to a planting approximately of 4 feet by 3 feet 7½ inches.

On very rich land it is a mistake to adopt close planting, as the top growth soon becomes intertwined, and thus produces a condition particularly favourable to development of disease. On the lighter soils where the growth is not rank, it would appear to be advisable to adopt fairly close planting (say 4 feet x 3 feet) in the hope of securing a good crown set, and consequently a higher early yield and probably a higher monetary return.

Closer planting with the bush method is more suited to the sparse-foliaged varieties, such as Early Pride and Earliana types, rather than to the Chalk's Early Jewel and Bonny Best and other bushy varieties.

Fertilisers.

All competitors used fertiliser, and are probably better acquainted with the necessity for its use on their particular holdings than anyone else. It seems to me that, from the results obtained, the chief plant food required in the early stages of growth is phosphoric acid, such as is contained in superphosphate and in bonedust. On some of the lighter type soils a fertiliser containing nitrogen, such as sulphate of ammonia, appears desirable, but on the better class soils it is doubtful whether this constituent is required until a set of fruit is in evidence.

This bears out results obtained by the Department in experiments in various parts of the State. On the better class soils nitrogen in the initial fertiliser may cause an over-vigorous, soft growth, which is more susceptible to disease attack, but nitrogen is certainly beneficial in all cases as a top-dressing when fruiting has commenced. A word of warning might be issued here in regard to the application of fertiliser as a top-dressing, as several competitors encountered foliage burn through the sulphate of ammonia coming in contact with the top growth. Its use is not advisable when the soil is dry.

On some of the poorer district soils the use of cow manure seems worth testing. This would enrich the soil and maintain a better moisture-holding capacity, so valuable during dry spells, which are frequent in the spring months. On the better class soils the use of this manure might easily be overdone and produce an over-vigorous, soft, early growth which is to be guarded against. I suggest its use on ridge soils, and particularly those of a light, gravelly nature.

A number of competitors are using complete fertilisers, and are advised to continue with their use until they find by experiment that some other combination is equally as productive at less cost.

Varieties.

As it is from early tomatoes that the district will receive the best return, varieties such as Denisonia and the Buckeye types are quite unsuited, and also such well-known varieties as Matchless and Burwood Prize.

Under the bush method of culture the Earliana and Early Pride types appear to me the most satisfactory. They are early croppers, and although the quality of the fruit may not be of the same standard as that of Bonny Best, Chalk's Early Jewel, or Marglobe, well-grown samples are quite satisfactory. The latter varieties were for the most part a fortnight later in maturing their crop under the bush method of culture, but appeared to be quite well suited to the single stem staked method of growth. One consignment of Bonny Best and Marglobe forwarded from Coff's Harbour district was considered to be the best that ever reached Sydney market.

Under the bush method of culture Bonny Best and Marglobe produce rather a compact bush, which makes them more liable to fungous disease in the spring months. They do not dry out the surplus moisture contained on the leaves so readily as do plants of the open bush type, such as Earliana and Early Pride. Application of dusts and sprays to the dense bush growths of Bonny Best and Marglobe types is hardly as likely to be as thorough as on the open type growth of the lighter-foliaged varieties, such as Earliana and Early Pride.

Purity.

The purity standard throughout was most satisfactory. In many cases it was quite obvious that the strangers in the plot were due to planting of refills of other varieties, due to shortage of plants of the type originally planted.

Cultivation.

Most competitors are apparently well acquainted with the advantages to be reaped from good cultivation. Weeds grow quickly in this region of the State, and their early control is most necessary if the crop is not to be robbed of valuable moisture. The stirring of the surface and preservation of a good soil mulch is a wonderful help to the crop, particularly during a year when a dry spell occurs. As growth advances, deep surface cultivation must not be carried out, as the root system of the plants will be interfered with.

It would seem that a few areas were not sufficiently well prepared before planting of the crop. It should be remembered that no amount of inter-cultivation after the crop is planted can make up for a faulty early preparation, and such areas are likely to be the first to be affected by dry weather.

General Remarks.

In offering a few suggestions concerning future competitions, I think it would be an advantage, from the point of view of estimating yields, if only one judging was provided for, and that to be undertaken in mid-October, and also if provision were made for entering only one variety in a plot. In one instance in last year's competition no less than eight varieties were included in one plot, thus necessitating a great deal of work in estimating the yield.

It might prove an advantage in future competitions to provide separate prizes for staked and bush-grown plots. Further, if the area of the plot were reduced to half an acre more competitors might be induced to try out the staked system of culture.

IMPORTS AND EXPORTS OF FRUIT.

THE following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st December, 1930:—

Description.	Imports.	Exports.
Interstate.		
	Cases.	Cases.
Fresh Fruit	522,745	122,047
Tomatoes	150,863	...
	bunches.	
Bananas	33	...
	tons.	
Melons	232	...
	cwt.	
”	3	...
	doz.	
”	62	...
	lb.	lb.
Canned Fruit	355,432	280
Dried Fruits—		
Unspecified	9,520	224
Currants	2,548	112
Raisins	2,800	...
Apricots	364	..
Apples	868	...
Peaches	140	...
Pears	112	...
Prunes	1,904	49,168

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples	....	...	339
Bananas	....	4,171	597
Lemons	....	...	538
Oranges	....	1	34,961
Grape Fruit	....	375	14
Pears	....	...	28
Pineapples	....	...	1,268
Other	....	32	5,950
Dried Fruits—		lb.	lb.
Apples	....	...	1,960
Apricots	....	...	698
Currants	....	...	12,328
Figs	Asia Minor	6,673	...
	Turkey	96,779	...
	U.S.A	37,816	...
Peaches	....	...	678
Prunes	....	...	1,549
Raisins—			
Sultanas	....	...	108,048
Lexias	....	...	288
Other	....		10,677
Dates	Arabia	3,500	23,433
	Mesopotamia	1,405,504	...
Other	China	10,120	2,731
Preserved in liquid—			
Apricots	....	...	238,589
Peaches	....	...	649,483
Pears	....	...	3,188
Pineapples	....	...	11,238
Raspberries	....	...	32,700
Other	....	Gallons. 1,081	11,709

GRAZING LUCERNE DOES WELL IN MANY DRY DISTRICTS.

PROBABLY the greatest development in pasture improvement work in New South Wales during recent years has been the extension into dry districts of lucerne growing for grazing purposes. Stands of grazing lucerne have been established at Coonamble, Trangie, Condobolin, Lake Cargelligo and in many other inland districts.

The ground should be thoroughly prepared and the seed sown not deeper than half an inch in the autumn (March-April), at the rate of 2 or 3 lb. per acre. Superphosphate (about ¾ cwt. per acre) sown with the seed will greatly assist in establishing a good stand. Write to the Department of Agriculture for leaflets on the subject.

A One-year Cane Competition.

CLARENCE RIVER, 1930.

L. S. HARRISON, Special Agricultural Instructor.

THE highly satisfactory number of fourteen entries were received for the first one-year cane competition conducted on the Clarence. The soils of the Clarence River have a very wide range in quality, and although a soil of the very highest fertility may not naturally be present on a grower's farm, very satisfactory results can very frequently be achieved by the adoption of the most suitable cultural methods.

Details of the Entries.

The cultural and cropping details are given below:—

Mr. A. Marsh.—Land sixty years under cultivation, previous crop part broom millet, part maize. This paddock had been out some years previously from cane. It was ploughed for this crop at the end of July, after which it cross-harrowed, re-ploughed, cultivated and ploughed again. Planting took place in early September in rows 4½ feet apart, single sets being planted by hand on the run about 2 feet apart and then hoe covered. The land was ploughed away, cross-harrowed, cultivated three times, ploughed three times, and again cultivated three times. Mr. Marsh used a fairly heavy dressing of varying rates of fertiliser, both phosphatic and nitrogenous, and it is probable that some of his success may be attributable to this cause. Stooling for an "on the run" planted crop was particularly good.

Mr. A. J. McDonald.—This entry was planted on a paddock fifty years under cultivation, and the present cane crop followed a crop of maize, which was preceded by maize, before which it had grown a crop of potatoes following cane. The paddock was ploughed in July, after which it was disc-harrowed, harrowed, rolled, re-ploughed, harrowed and rolled, disc-harrowed, harrowed and rolled. Planting took place early in October on the square, rows 3½ feet apart, drills opened with a plough and hoe covered; sets were double dropped. The plot was cultivated ten times and hand-hoed twice. This competitor also used fertiliser. It is significant that only the two leading crops were fertilised.

Mr. R. Anderson.—This was on old cultivation land which had not carried a crop of cane for thirty years. It was ploughed in August, harrowed, rolled, and re-ploughed, the three operations being repeated, after which it was harrowed and rolled. It was planted at the end of September by machine in rows 4 feet 4 inches apart, double sets being dropped on the run about every 2½ feet. The crop was later ploughed away and raked off, cultivated six times, and hand-worked twice. Mr. Anderson was unfortunate in that his crop lodged to such an extent, but so rich an area, treated as it was, is open to this possibility.

Mr. C. Bathgate.—This again was old cultivation land, and was planted after maize and cowpeas, following a crop of cane. Maize stalks and cowpeas were rotary-hoed, then rolled, harrowed each way, and rolled again. Planting took place at the end of September by hand in rows 4½ feet apart. Drills were opened by the plough, and the single sets, every 18 inches, were plough covered. Later it was rolled, harrowed, ploughed away and relieved, hilled, middles ploughed out and cultivated; and in February ploughed away again, chipped, hilled, and the middles cut out.

Mr. J. Hart.—This again was old cultivation land, and the previous crop was maize following cane. It was ploughed in August and re-ploughed in October. Planting took place at the end of October in drills ploughed out every 3½ feet, two sets being dropped on the square by hand and hoe covered. It was scuffled sixteen times and chipped twice.

Mr. Anderson's Crop—the Heaviest Yielder in the Competition.

Mr. K. Ryan.—Old cultivation land, with maize following cane the previous crop. Planting took place in September, when drills were ploughed out 4½ feet apart and sets hand dropped on the square. It was ploughed away three weeks after planting, then ploughed back, cultivated three or four times, and hilled.

Mr. F. Carr, junr.—Old cultivation land, following cane. Ploughed in May, after which it was ploughed twice and dis-harrowed three times. It was planted early in September in rows 4 feet apart on the run by hand about every 2 feet. After planting it was ploughed away four times, middles scarified out, and hand-chipped three times.

Mr. H. Ellem.—Old cultivation land, maize following cowpeas following cane being the previous crop. It was ploughed in August, then harrowed, rolled and ploughed and harrowed, rolled and ploughed again. Planted end of September by hand in rows 4 feet apart with a single drop on the run, approximately every 18 inches. It was later harrowed, ploughed away, then cultivated, chipped, ploughed away, chipped and centres cleaned with the plough, and then twice cultivated.

Mr. P. McConnell.—Old cultivation land, maize and cowpeas following cane being the preceding crop. Ploughed in April, harrowed, rolled, disced and re-ploughed, disc-harrowed, harrowed and rolled. Planted end of September with the machine in rows 4½ feet apart, single sets on the run about 2 feet apart. After planting it was ploughed away, chipped, and ploughed back, with these operations repeated, and lightly hilled.

Mr. D. Anderson.—Old cultivation land that had been out some little time prior to the last crop of cane, which was followed by maize and cowpeas prior to this planting. It was ploughed at the end of July, then disced, harrowed, and rolled, re-ploughed, harrowed, and rolled. Planting took place at the end of August with the machine on the run, in rows 4½ feet apart, with a single drop about every 18 inches; after that it was ploughed away and raked off, cultivated, hilled with a plough, cultivated six times and chipped twice.

Mr. S. J. Bathgate.—This land had been under cultivation about sixteen years, and the previous crop was maize, cowpeas having failed. The first ploughing took place in September, after which it was rolled twice and harrowed three times. It was planted at the end of September in drills 4½ feet apart, the sets being dropped by hand on the run. Later it was rolled down, ploughed away, relieved, cultivated five times, and hilled.

Mr. E. R. Watts.—Old cultivation land with a recent seven years' spell. It was ploughed in July, harrowed three times, re-ploughed, rolled, harrowed three times, and re-ploughed. It was planted early in September by machine (in drills) in rows 4 feet apart, with a double drop on the square every 3 feet 6 inches. It was afterwards ploughed away six times and ploughed back, then scarified six times and hand-chipped.

Mr. F. Bathgate.—Old cultivation land, crops of maize and cowpeas having been planted prior to this cane. The land was rotary-hoed twice and ploughed in August. Planted mid-October in rows 4½ feet apart, double sets being dropped every 18 inches on the run by hand in drills, opened and covered with the plough. The paddock was later rolled and harrowed, ploughed away, harrowed, cultivated twice, hilled and middled.

Mr. B. Kenny.—Land approximately thirty years under cultivation, maize following the preceding crop of cane. It was first ploughed early in August, later being harrowed, rolled and re-ploughed, and then harrowed and rolled. Planted end of September in rows 4½ feet apart, single sets being dropped by hand on the run; drills plough-opened and covered. It was later ploughed away and back, raked off, scuffled six times, ploughed away and back, and chipped twice.

Comments.

These cultural details disclose a considerable knowledge of soil and crop requirements. Growers realise that cane is a crop that well repays correct preparation and control of soil conditions. The almost universal cultivation of cowpeas with the maize crop between cane plantings cannot be too highly commended.

The advisability of ploughing in trash between cane plantings must be considered; some growers already do carry out this practice. In addition, the conservation of trash for ratoons is receiving attention on the Clarence.

The question of early ploughing and the effect it has in enabling a grower to put his soil into proper tilth is one that might receive the attention of all growers. Another point of considerable interest is the ploughing away from plant cane as a regular procedure. The practice of ploughing away for a definite purpose, such as for weed control or regulation of cover depth at an early stage, is undoubtedly sound, but when proper cultivation methods have been employed in the first place this operation should not be necessary to its present extent, and probably in some seasons it may be decidedly objectionable. This applies to plant cane only.

The question of using fertiliser is one for experimental determination, and although Messrs. Marsh and McDonald did use fertiliser on their blocks it cannot be taken definitely from this competition that the improved results were entirely due to the use of fertiliser. Growers, however, should pay close attention to this method of crop improvement.

In an area as widespread as the cane-growing lands of the Clarence it is clear that varying qualities of soil will cause considerable variation in resultant cane acreage values. This competition, of course, is able to take no cognisance of soil quality, although it must bear a definite relationship to the points under the heading of value. However, by careful systems of farming and close attention to detail this possible wide variation may be considerably reduced.

RESULTS—Clarence River One-year Cane Competition, 1930.

	Cultivation. (Maximum 20 points.)	Evenness and Lack of Patchiness. (Maximum 20 points.)	Stooling. (Maximum 10 points.)	Freedom from Disease (Maximum 15 points.)	Freedom from Lodging. (Maximum 10 points.)	Value. (2 points for every £7 10s of value).*	Estimated Tonnage Per Acre.	P.O.C.S.	Net Value after deducting Harvesting Expenses.	Total.
									£	
A. Marsh	18½	18	9	15	10	7	20	12·94	26	77½
A. J. McDonald ...	18½	19	7	15	10	8	25	12·02	29	77½
R. Anderson ...	18½	18	9	15	5	11	35	12·46	43	76½
C. Bathgate	17½	18	6	14	10	9	25	12·87	32	74½
J. Hart	15	17	8	15	9	10	30	12·57	37	74
K. Ryan	18	16	7	15	10	8	20	14·13	29	74
F. Carr, jnr.	17	15½	6½	15	10	10	25	14·78	39	74
H. Ellem	17½	16	7	15	7	10	25	14·29	37	72½
P. McConnell ...	17½	17	7½	15	10	5	15	12·55	18	72
D. Anderson ...	18½	15½	7	15	10	6	20	11·85	22	72
S. Bathgate	17½	16	7½	15	10	6	20	12·20	23	72
E. Watts	14	16½	8	15	10	6	15	13·96	22	69½
F. Bathgate	15	16½	7	15	10	6	20	12·42	24	69½
B. Kenny	12	15½	8	15	8	7	25	11·41	26	65½

* A strict interpretation of the points would provide that multiples of 2 only appeared in the column for value, but it appears equitable to allot the points as has been done.

Dressings for Fly-struck Sheep.

TRIALS AT NYNGAN EXPERIMENT FARM.

C. R. MULHEARN, B.V.Sc., Veterinary Research Officer, Council for Scientific and Industrial Research.*

FOLLOWING the conclusion of a series of tests with a large number of oils as to their suitability as vehicles for blowfly dressings (see *Agricultural Gazette,* Vol. 41, 1929, page 905), a number of drugs and several proprietary mixtures were tested as to their value as dressings.

The Properties of a Good Dressing.

A good dressing for use on fly-struck sheep should possess the following qualities:—

1. It should kill or remove all maggots without injury to the sheep.
2. It should be non-irritating to skin or wounds, and non-injurious to the wool of the sheep.
3. It should dry up the crutch and be soothing and healing to the wounds.
4. It should act as a repellant to flies so as to prevent re-striking.

Classes of Dressings.

The dressings used may be divided into several classes, viz., (1) oily dressings; (2) watery dressings; (3) emulsions; (4) semi-solid dressings, where lard or some such substance is used as a base; (5) powdery dressings.

Oily Dressings are usually employed where the active constituent is soluble in oil but insoluble in water, *i.e.*, the oil is used as a vehicle to carry the active constituent. Oily dressings have the advantage of penetrating through and remaining in the wool better than most other dressings. They are not so liable to be dissolved and washed out by rain or urine. As a result of the investigation of a large number of oils, referred to above, certain fish oils were found to be more suitable than other oils tested. Where it is noted in this report in connection with mixtures having pale mineral oil as a basis, that irritation of the skin was caused, some slight part of such irritation should be attributed to the oil used as a vehicle.

Water is often used as a vehicle where the active constituent of the dressing is soluble therein. It has the advantage of being cheap but it does not penetrate into, nor adhere to, the wool as well as a dressing in which oil is used as a vehicle.

Emulsions are used when it is desired to add oils to a dressing in which the active constituents are soluble only in water. In this instance the purpose of emulsifying the oils in the dressing is to increase the penetrating power of the dressing and also its adhesiveness to the wool. Emulsification may be used also when an oily active constituent, insoluble in water, is employed in a dressing where water is used as a vehicle. This form of a dressing may also be used when it is desired to combine two active constituents, one of which is soluble only in oil and the other only in water.

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*Sheep blowfly investigations are carried out under the ægis of the External Parasites of Sheep Committee of the New South Wales Department of Agriculture. Mr. Mulhearn is at present on loan to the New South Wales Department.

Semi-solid Dressings such as lard, lanoline, &c, are sometimes used as a vehicle for active constituents. These dressings adhere better when rubbed in, but the method of application is too cumbersome.

Powders are sometimes used as fly dressings. They are most commonly applied to rams' heads as a preventive.

The Drugs Tested.

Phenol, as an active constituent of a fly dressing, has been used extensively at Nyngan. In the first trials an aqueous solution of carbolic acid was used, but the water did not mix readily with the oily vehicles, and phenol crystals were used later in place of the liquid forms. The method of mixing was to warm the crystals so as to change them to a liquid state and then to mix the molten phenol with warm oil, subsequently allowing the dressing to cool. It was found that in the strengths required for the dressing the phenol would not recrystallise out.

The phenol was first used in light pale mineral oil, but as this was found to be irritating to the skin it was replaced by whale oil. Strengths of 2½, 4, 5, 6, and 10 per cent. phenol in whale oil were tested. Of these, the strength of 2½ per cent. was not sufficient to kill all the maggots, while the 10 per cent. solution, though very efficacious in killing and removing the maggots, was too severe on the skin of the sheep, causing scalding and lifting of the wool with blistering of the woolless skin round the tail. It was found that a 4 per cent. mixture in oil was the strongest solution that could be used without harmful effects to the skin of the sheep. This strength is usually successful in killing or removing the maggots from the struck area in moderate cases, but when flies are striking the sheep badly and when extensive wounds are present in the struck areas, the maggots are able to seclude themselves either in a wound or under a scab where the dressing in the strength of 4 per cent. is not sufficiently potent to overcome them. Where live maggots are present in wounds, &c., the sheep soon become re-struck, especially when flies are bad, for the latter are attracted to these situations by the exudations given off by the maggots working in the wounds. When the maggots are killed or are removed and the wounds are not interfered with by the flies, this dressing rapidly promotes drying and healing of the wounds under scales which do not crack or lift till the wound is completely healed.

Phenol in oil does not appear to be of much value as a repellent to flies, for when striking badly they have been observed to light on a struck patch almost immediately after it has been dressed, and in some cases to deposit their eggs, which may hatch out and mature if the dressing has not been very well retained in the wound. The eggs usually fail to hatch and die if

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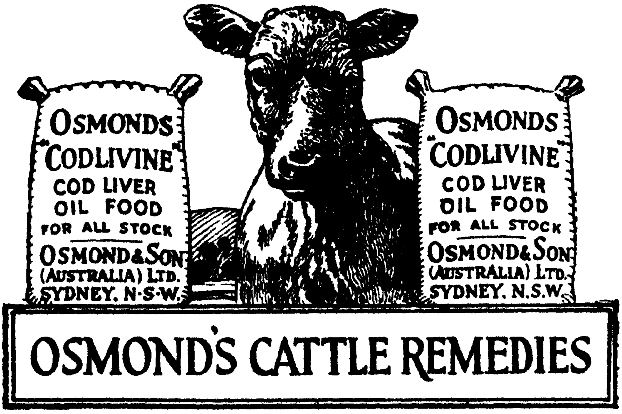

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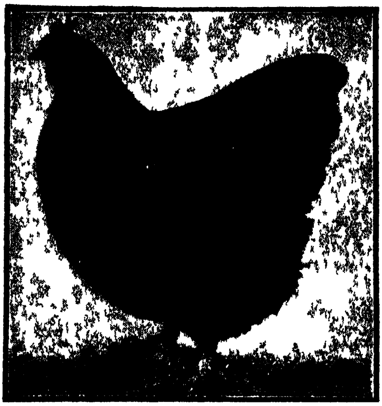

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Department of Agriculture,
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deposited in the wool where the dressing is present. In those cases where a wound is re-struck and the maggots survive, they may spread again, following repeated re-strikes, right through the dressed area, and within twenty-four to twenty-eight hours after the original dressing, the sheep is again badly struck in the same situation. In other cases the maggots may spread away from the original dressed area, and so the sheep is re-struck, not over the site of the dressing but adjoining it.

A 5 per cent. aqueous solution of carbolic acid has been used as a dressing, but this is not so soothing or healing as the oily preparations, and in some cases it was irritating to the crutch, blistering the woolless skin round the tail.

Jeye's cyllin, in strengths of 2½, 5, and 10 per cent. in pale mineral oil was tested as a dressing, and a 5 per cent. aqueous solution was also used.

A strength of 2½ per cent. cyllin in pale mineral oil is not always successful in killing or removing all the maggots from the struck area. This preparation dries the wounds fairly well and promotes healing fairly rapidly, but it is not of much value as a repellent, several sheep having been re-struck a short time after being dressed.

Numerous sheep were dressed with 5 per cent. cyllin in pale mineral oil. Its immediate action on the maggots is quite good, for it first acts as an irritant, causing accelerated movements, and after a few minutes it kills all the maggots which come into contact with it. In some instances, particularly those where only a small area is struck, the dressing cleans and heals up the wound rapidly, but in the majority of cases there is evidence of blistering and scalding of the crutch, where the dressing is applied; in these cases the wounds do not heal as readily as they might and there is often pus present. The dressing causes pustule and blister formation on the tender skin of the tail and vulva. Where the dressing comes into contact with the skin of the sheep it causes the wool to lift, leaving bare patches. The wool becomes harsh and lifeless in these situations, and if it is constantly wetted, as by urine, after the dressing is applied, the skin may lift off with the wool leaving raw areas which contain much pus. These sheep are then attractive to the flies and so are more susceptible to re-strike than they would be normally. For these reasons this dressing is not a good preventive, but is rather inclined to predispose to re-strike. A great number of sheep were found re-struck a fortnight to a month after being dressed with 5 per cent. cyllin in light mineral oil.

A few sheep were dressed with 10 per cent. cyllin in oil, but although its action of killing the maggots was particularly good it was too severe on the sheep to be of practical use as a dressing.

A 5 per cent. aqueous solution of cyllin was tried. This dressing has no immediate killing action on the maggots, but it acts as an irritant to them, causing accelerated movements. One dressing was sufficient to remove the maggots from each sheep treated. In some cases the dressing caused the formation of blisters and pustules round the woolless skin of the tail. The drying action of aqueous solutions of cyllin is quite good; the wounds and wool round the struck areas are dried up, but the solution is also inclined to harden the skin. Its action on the wool is somewhat similar to that of zinc or copper sulphate—it dries the wool and makes it harsh. This drying of the wool and the wounds should act as a preventive of re-strike, but the dressing has no other repellent action and sheep have become re-struck a short time after its use.

Jeysol, 2½ per cent. solution in pale mineral oil, has a primary irritating action on the maggots, and it later sickens and kills them. This dressing is also a little irritating on the skin of the sheep, causing the formation of pustules and occasionally scalding of the skin and lifting of the wool. Owing to its irritating action it does not aid the healing of wounds. It is of little value as a preventive of re-strike for several sheep were re-struck less than a week after dressing.

A 5 per cent. solution of Jeysol in pale mineral oil kills all the maggots in from five to ten minutes after application, but this strength is too severe on the sheep as it blisters the tender skin of the tail and causes scalding and lifting of the wool, leaving bare, raw, pus-infiltrated patches about a week after dressing. On account of its irritant action it is no aid to the healing of wounds and it is in no way a preventive of re-strike, but is rather inclined to predispose to re-strike by its action on the skin.

A 5 per cent. aqueous solution of Jeysol was used, but its action is not sufficiently toxic to the maggots, for in the majority of cases it failed to kill or remove the maggots from the struck area. This dressing has no drying action on the crutch, and where it is retained in the wrinkles it is rather inclined to keep the wool wet.

Cresylic Acid in pale mineral oil, is very irritating to the maggots and kills them off in from five to ten minutes after its application. This dressing is very similar in its action to that of 5 per cent. cyllin in pale mineral oil, in that it is very severe on the sheep, causing the wool to lift and leaving raw, pus-infiltrated patches. On account of this action it predisposes to re-strike.

A few sheep were dressed with a 10 per cent. solution of cresylic acid in pale mineral oil; its action is much the same as the 5 per cent. strength, but is more severe.

Better results were obtained with a 2½ per cent. solution in pale mineral oil, but this strength will not always kill the maggots, and it also is inclined to scald and blister the crutch. As a preventive of re-strike it is better than the stronger solutions, chiefly because it is not so severe on the sheep, but it is doubtful if it has any repellent action on the flies.

Beechwood Creosote, 5 per cent. solution in pale mineral oil, was also tested. Although the immediate action on the maggots was slight, at a second examination twenty-four hours later, all the maggots had gone. This dressing is a fairly good healing agent, drying up the wounds and causing them to heal fairly quickly, though it is not so good in drying up the soiled portions of the wool of the crutch. As a repellent of flies it has no lasting effect, for several cases were re-struck in less than a week after its application. A strength of 10 per cent. in pale mineral oil has been used in a few cases, but it has no advantage over the 5 per cent. strength and it has the disadvantage of being too severe on the sheep, causing blistering and scalding of the skin of the crutch.

Kerosene was used in 5, 7½ and 10 per cent. solutions in pale mineral oil. A 5 per cent. solution is not sufficiently toxic to the maggots to kill or remove them from the crutch with one application. A 7½ per cent. solution is better in this respect, but it does not always remove the maggots. With a 10 per cent. solution, although there was no immediate action on the maggots in the few cases treated, one dressing was sufficient in every case to remove all the maggots. The latter strength is inclined to cause blistering round the woolless skin of the tail. A week to ten days after dressing there is evidence of a slight scalding and thickening of the skin, causing the wool to lift off, leaving bare areas.

The action of this dressing on the wounds is good; they are dried up and heal readily, and in this way the dressing may act as a preventive of re-strike, but it has no lasting repellent action to the flies.

Benzine (motor spirit) was tried as 10 per cent. and 20 per cent. solutions in pale mineral oil. There was no immediate and little after-effect on the maggots in any of the cases dressed, for live maggots were found working on the sheep in all the cases at the next inspection. This dressing appeared to have little action on the crutch, and it was in no way a repellent, for the sheep were re-struck a few days after dressing.

Oleum terebinthinae (turpentine), 10 per cent. in pale mineral oil, is not always successful in killing the maggots when applied to struck sheep. With this strength there was a slight evidence of scalding of the skin of the crutch.

One case as treated with a 25 per cent. solution of oleum terebinthinae in pale mineral oil, but, although the dressing removed all the maggots it was too severe on the sheep.

To try the repellent action of oleum terebinthinae strengths of 3 and 6 per cent. were added to a dressing of 4 per cent. phenol in pale mineral oil, but it did not have any beneficial action in preventing re-strike. With these strengths added to the phenol dressing, numerous cases of re-strikes occurred a few days after the initial dressing, and the only difference in the action of the dressing was that it became too severe on the sheep, and two cases with very bad strikes were killed by the action of this combined dressing.

Eucalyptus, 10 per cent. solution in pale mineral oil, was tried. In the majority of cases a dressing of this strength is not sufficiently toxic to kill or remove the maggots. The dressing dries and aids in the healing of wounds with the formation of fairly soft scabs, but it is inclined to cause blistering where it comes into contact with the woolless skin of the tail. A 25 per cent. solution was also used on one sheep, but although it removed the maggots satisfactorily it caused a slight scalding and blistering of the skin of the crutch. This dressing does not appear to have a lasting repellent action to the flies, for the eggs were deposited on the struck area within forty-eight hours of the application of the original dressing, though the eggs failed to hatch and the sheep remained free from re-strike for about a fortnight.

Copper Carbonate was employed as the active constituent of some dressings. This preparation is a powder, and it was rubbed up with the pale mineral oil to make a 5 per cent. mixture (by weight). The dressing did not have any immediate action on the maggots, and in the majority of cases they were still alive and working on the struck patch about twenty-four hours later. The dressing dried and healed the wounds very rapidly, and also had a beneficial drying action on the wool, which does not become so harsh as with dressings such as aqueous solutions of copper sulphate or cyllin. In some of the cases the wool lifted from the skin over the dressed area, leaving a bare patch which was fairly soft and pliable.

As a preventive of re-strike this dressing should be of value on account of its drying action to the wool and wounds; but it has the disadvantage of colouring the wool. The colour is not so durable as, nor does it spread through the wool like, that of aqueous solutions of copper sulphate.

Oleum chenopodium, 5 and 10 per cent. in whale oil and in pale mineral oil has been used fairly extensively. This dressing kills all the maggots in from ten to fifteen minutes after its application. A 10 per cent. solution in pale mineral oil has a very mild irritating action on the skin of the sheep, but a 5 per cent. solution has no harmful action on the skin of the crutch. Such a strength is not as effective in killing or removing the maggots. The dressing dries the crutch moderately well, but it has no pronounced healing action, although it does not retard the normal healing of wounds.

This drug has a distinctive odour which is noticeable in the dressing and can still be detected on the crutch of the dressed sheep from a week to ten days after the application of the dressing. It is on account of this odour that the dressing is of value as a repellent, for it has kept bad cases free from re-strike for a week to a fortnight after its application. Wounds on dressed areas may be re-struck before they have healed, and from this situation the maggots may spread through the dressed area; but where there are no wounds in which the maggots may re-establish themselves, it is unusual to find sheep re-struck after being dressed with this preparation. The repellent action of this drug lasts about one week.

This dressing is beneficial for dressing obstinate cases in which sheep, especially predisposed to fly attack, are found struck at almost every examination. It is usually successful in keeping these cases free from re-strike for sufficient time to allow the crutch to recover and the small wounds to heal.

Xylol, 10 and 20 per cent. in pale mineral oil, has been used. This preparation has no immediate action on the maggots. The latter strength is usually effective in killing or removing all the maggots within twenty-four hours, but when the weaker strength is used it is not unusual to find some of the original maggots working on the struck area at next examination.

This dressing has no irritating action on the skin of the crutch, nor does it aid the healing of wounds. It does not appear to have any special action as a repellent or a preventive of re-strike, for sheep were re-struck a short time after its use.

Formalin, in a 10 per cent., aqueous solution, has little effect on the maggots, though they are usually removed by a 20 per cent. solution. Both solutions damage the crutch, with the formation of pustules and a thickening of the skin. Healing is very slow, after the application of these dressings and they afford no immunity from re-strike.

Aniline, 5 per cent. solution in pale mineral oil, has an immediate irritating action on the maggots, and in all the cases dressed they have been killed or removed from the struck area. Occasionally there is a mild blistering action of the woolless skin of the crutch. The dressing does not dry the crutch very well, nor does it greatly aid the healing of wounds. It appears to have some value as a repellent, for, of all the sheep dressed, one only was re-struck before the dressing had worn off, and that one was eight days after the original dressing.

Oil of citronella, 5 per cent. in pale mineral oil, not only fails to remove or kill the maggots, but it has a slight blistering action on the crutch. The citronella imparts its characteristic odour to the dressing, and this is quite noticeable in the wool for a few days.

Carbon tetrachloride has been used in strengths of 5, 10, and 20 per cent. in whale oil. Strengths 5 and 10 per cent. are not sufficiently potent to kill or remove the maggots in all cases; in the less severe strikes these strengths may be successful in removing all the maggots, but in some bad strikes several dressings with a 10 per cent. mixture are necessary before the struck area is made clean.

A 20 per cent. mixture of carbon tetrachloride is usually quite successful in killing or removing the maggots from the struck area in less than one hour after its application. Odd cases have occurred where a few maggots have secluded themselves in a wound or under a scab and thus have avoided the action of the dressing and have been found on the sheep a few days later.

As a healing agent this dressing does not compare very favourably with some other preparations, for the wounds are not dried up but remain soft and raw looking for some time after the application of the dressing. The characteristic odour of the carbon tetrachloride is very noticeable in the wool after dressing, and it can still be detected for a few days after its application. For this reason the dressing has some slight value as a preventive of re-strike. In bad cases where the skin is chafed and broken from being constantly wet with urine, re-strikes have occurred in the small wounds within twenty-four hours of the treatment, but where there is sufficient wool to retain the dressing, re-strikes have not occurred for at least five days and then only when the dressed area has been constantly wetted with urine for a few days, or in some other way rendered attractive to the flies. Eggs deposited in the wool five days to a week after dressing have failed to hatch out.

Zinc sulphate in aqueous solutions containing 3, 5, and 6 per cent. have been used as dressings for fly-struck sheep. These strengths dissolve readily in water. A strength of 3 per cent. irritates the maggots, but does not always succeed in killing or removing them from the sheep, and 5 and 6 per cent. aqueous solutions cause an immediate irritating action to the maggots, which are either killed or drop off the sheep within one hour of treatment. In occasional cases a few maggots may survive the original dressing and be found at the next examination, and, if so, they are usually away from the dressed area or in a skin wound, shear cut, &c.

Where there are extensive wounds this dressing may be irritating to the sheep for a while, as evidenced by excessive kicking, but there is no lasting irritation to either the crutch or the skin round the tail with a strength of 5 per cent., though there have been cases of slight scalding when a 6 per cent. solution was used.

In all cases with this dressing the drying action on the crutch and wounds was particularly good, for within twenty-four hours after its application the wounds were dried up very well and covered with firm scabs which as a rule did not crack, but it was not uncommon to find pus under them. The action on the wool is very drying; the short wool is inclined to curl up, whilst the longer wool becomes dry and harsh to the touch. This drying action of the dressing would tend to act as a preventive of re-strike and should keep the sheep free till the wool again becomes saturated with urine and rendered attractive to the flies.

The dressing does not appear to possess any repellent action, for one sometimes finds sheep that have been dressed with this preparation re-struck a short time afterward if the crutch has become considerably urine stained or in some other way rendered attractive to the flies.

This action of zinc sulphate in aqueous solutions when used as a fly dressing is almost identical with that of aqueous solutions of copper sulphate of the same strength, with the exception that copper sulphate colours the wool. The harshness imparted to the wool by zinc sulphate is only temporary and passes off after a week or two without leaving any noticeable blemish to the fleece. The colour from the copper sulphate is fairly permanent and may spread a considerable distance in the wool.

Zinc Sulphate and Carbon Tetrachloride in Oily Emulsion.—A dressing was prepared in which a quantity of carbon tetrachloride was mixed in fish oil, and the mixture emulsified with an aqueous solution of zinc sulphate by the use of gum acacia. The dressing contained—5 per cent. gum acacia, 5 per cent. carbon tetrachloride, 15 per cent. whale oil, and 75 per cent. aqueous solution of zinc sulphate of sufficient strength to produce a dressing in which the concentration of zinc sulphate was 5 per cent.

This dressing, besides having all the advantages of an aqueous solution of zinc sulphate, contains a repellent, and is much easier to apply to the wool of the sheep.

Zinc oleostearate.—Dressings of 5 per cent. and 10 per cent. zinc oleostearate rubbed up in whale oil have been used. These dressings have little action on the maggots, for they usually fail to kill or remove them from the crutch of the sheep. The astringent action which is so noticeable with the aqueous solutions and emulsions of zinc sulphate is entirely absent with this oily preparation.

Benzol.—Pure benzol and in strengths of 5, 10, and 50 per cent. in light mineral oil, has been used. Pure benzol is very efficacious in killing the maggots; its action is almost immediate and all the maggots are destroyed within a few seconds of its application. The dressing is also very irritating to the sheep, as evidenced by kicking, stamping, and general signs of uneasiness exhibited immediately the sheep is released after being dressed. The action on the skin following the use of this dressing is severe. A few days after application the skin becomes hardened and lifeless, and later, extensive cracks which act as a favourable site for re-strike, appear over this area.

The effect of the benzol is retained in the wool for a few hours, but after that time the characteristic odour disappears and flies have been noticed to alight on the dressed areas as though no dressing had been applied. As a preventive of re-strike this preparation has no value, and the majority of cases treated were re-struck within a few days of being dressed. The action on the skin in causing extensive cracks would tend to predispose to, rather than act as a preventive of re-strike.

Benzol, 50 per cent. in light mineral oil, is very efficacious in killing maggots, but it is not so rapid in its action as pure benzol. This strength is too irritating to the sheep, for it hardens and causes the skin to crack where it is applied. It is not unusual to find sheep that have been dressed with this preparation re-struck a few days later. This strength of benzol could be used to advantage for killing maggots in obscure places such as in deep wounds or down behind the horns of rams, but it should be followed by a more soothing dressing which should also act as a preventive of re-strike. Benzol, 10 per cent. in light mineral oil, kills the maggots very satisfactorily, but it also has the disadvantage of hardening, and, in some cases, of cracking the skin.

Benzol, 5 per cent. in light mineral oil, will usually kill all the maggots within about ten minutes of its application. In odd cases where wounds are present the maggots may burrow into the flesh or under scabs before they are overcome by the dressing, and in these situations they may survive. As with other strengths, 5 per cent. benzol does not act as a preventive of re-strike, for it is not uncommon where flies are striking badly to find sheep re-struck as soon as the action of the benzol has worn off, which may be in less than twenty-four hours.

Arsenic Dressing.—This dressing, which is a 5 per cent. concentration of arsenic (dissolved with soda) in an emulsion of equal parts of light mineral oil and water, has been used extensively. It has an irritating action on the maggots, which are usually killed or removed from the struck area on the sheep within twenty-four hours of the application.

The dressing is very irritating to the sheep, as evidenced by stamping and signs of uneasiness after dressing. Some time later it often causes extensive scalded areas which may be followed by a sloughing of the skin, leaving raw, pus-covered patches which are attractive to the flies, and so predisposes to re-strike. This is especially so when the skin is being constantly wetted by urine. At times when the struck area remains dry there is formation of a hard crust over the skin, and this crust later lifts with the wool, leaving bare patches beneath. In some cases, while the dressing remains in the wool for about a week after its application, it acts as a preventive of re-strike in that it destroys new eggs and small maggots which are deposited by the flies.

This dressing retards rather than aids healing, for not only is it irritating to the wound, but it also forms hard scabs and injures the adjoining skin. Some wounds after the application of this dressing have taken much longer to heal than they would have done under normal circumstances.

This preparation is not of much value as a repellent, for flies have been noticed to alight on the struck area a short time after treatment.

Monsol mixes readily with water forming a milky fluid which turns a pinkish colour on exposure to the air. It also mixes readily with oils. A 2 per cent. aqueous solution, although having an irritating action on the maggots and removing them from the sheep in the majority of cases, is sometimes not sufficiently toxic and the maggots remain working on the sheep. A 5 per cent. strength gives better results in this respect, and usually the maggots are all killed or removed from the crutch or struck area within an hour of dressing. It is only very occasionally that one still finds maggots on the sheep twenty-four hours after the application of this dressing, and when such is the case there is usually an open wound or a scab under which they secrete themselves and so avoid the full effects of the dressing.

There is a slight irritating action to the sheep when the dressing is first applied, especially when open wounds are present on the struck area. This irritation soon passes off and there are no further changes such as thickening of skin, &c. The dressing when mixed is a white colour and of milky consistency, and even though water is used as the vehicle it penetrates through the wool fairly readily. When in the wool, where the dressing is exposed to the air, it turns a light pinkish colour and slightly discolours the wool. This discolouration is only temporary and passes away about a week after treatment. The dressing has an astringent or drying action on the wounds and wool of the sheep, somewhat similar to, but not so pronounced as, that of aqueous solutions of zinc sulphate. It aids healing and dries up the wounds which are covered by fairly hard scabs. These, in some of the larger wounds, have been known to crack.

It is doubtful if the dressing has any considerable repellant action to the flies. Owing to its drying action to the wool and wounds of the struck sheep, and also to its promotion of more rapid healing, it acts as a preventive of re-strike. In a few cases in sheep particularly attractive to the flies, re-strikes have occurred a few days after dressing. Generally, however, in the average sheep, the dressing will clean up the strike satisfactorily and keep the sheep free from re-strike for some time. When extensive wounds are present the scabs over these sometimes crack and a re-strike may occur in these situations.

A 5 per cent. solution of Monsol in whale oil has been tried, but this is not satisfactory in killing or removing the maggots from the sheep and the astringent action is not so pronounced as with the aqueuos solutions.

Proprietary Preparations Tested.

Preparation No. 1.—This preparation was used in the strength recommended by the proprietors, *i.e.*, one part of the mixture in twelve parts of water. In the majority of cases this dressing did not appear to have any effect on the maggots as they were still found on the struck area at subsequent examinations, and it was found necessary to re-dress the sheep with another dressing.

Preparation No. 2.—This dressing is a black coloured preparation, and when applied to sheep it colours the wool, but the colour is not very persistent and soon wears off. The dressing has a slightly irritant action on the maggots, but it also appears to irritate the sheep considerably, as evidenced by repeated kicking of the hind-legs and other signs of irritation after dressing. Although this dressing has only a slight immediate action on the maggots it is always successful in killing or removing them in a few hours. In some cases where this dressing comes in contact with the vulva of the ewe it causes a blistering or swelling of that region, and this may still be present at subsequent examinations of the animal. After dressing with this preparation there is often considerable scalding of the crutch. This is later followed by lifting of the wool, and, especially when wetted by urine, the skin may also lift off with the wool, leaving a sore area which contains much pus. The sheep is then often re-struck in these areas.

As a repellent this dressing is not of much value, for eggs have been found on the struck patches a few days after the application of the dressing. In these cases, however, the eggs have failed to hatch out and the sheep remained free from re-strike for some time. In those sheep where scalding and lifting of the skin has occurred, cases of re-strike were not uncommon about a week to a fortnight after the original application of the dressing.

Preparation No. 3 is very similar to No. 2, and it is also very similar in its actions. It is probably a little more irritating to the sheep than No. 2.

Dressings Which May Be Recommended.

As a result of the experience gained during the testing of the foregoing and of the routine dressing of sheep under station conditions, the opinion has been formed that the best dressing is a 5 per cent. aqueous solution of Monsol. This dressing penetrates into and runs through the wool comparatively well, and besides being very efficacious in removing the maggots from the struck area, has an astringent action, though this is not so pronounced as that with zinc sulphate.

The best oily dressing used is 4 per cent. phenol crystals in whale oil with the addition of either 5 per cent. carbon tetrachloride or of 2 to 4 per cent. oil of chenopodium as a repellent. The above dressing has proved, when suitably applied after proper cleaning-up of the struck area, to be adequate as a routine dressing when flies are striking at anything but at their worst. Re-strikes are uncommon and one dressing usually suffices. When slight to moderate strikes have to be dealt with the phenol and whale oil dressing itself proves adequate, but when the strikes become more frequent it is necessary to add a repellent. During times of bad strikes even these repellents appear inadequate as flies are so suicidal in their habit, so very persistent in their egg-laying under these circumstances, that nothing seems to repel them.

A 5 per cent. aqueous solution of zinc sulphate also makes a good dressing. It has all the good points associated with the use of copper sulphate (bluestone), but does not discolour the wool. As with most watery dressings there is the disadvantage that it does not penetrate into nor run through the wool nearly as well as an oily dressing. This can be overcome to some extent by applying the dressing with a small hand spray pump. The drying action of the dressing on the wounds is good and should keep the sheep free till the wool again becomes saturated with urine and rendered attractive to the fly. This dressing imparts a harshness to the wool, but it is only temporary and the harshness, whilst it lasts, renders the wool unfavourable to re-strike.

As a rapid maggot-killing agent, benzol seems unequalled, but in the strengths in which it has to be employed it is irritating in its effect; it might be used with advantage for killing maggots in obscure places such as in deep wounds or down behind the horns of rams. In such cases, however, it should be followed by a more soothing dressing, preferably one which has a repellant action, for benzol does not act as a preventive of re-strike.

WAXED CALICO FOR BUDDING.

To make waxed calico for budding, secure a good, strong, cheap calico which will tear easily without fraying. Tear into strips varying in width from 8 to 15 inches, according to the size of the stocks to be budded or grafted. The strips should be wide enough to wrap around the stocks at least four or five times. Take three parts (by weight) beeswax, three parts resin, two parts mutton tallow, and melt up together, and, while still hot, dip the calico into the mixture and draw it out between two straight-edged sticks held tightly together. These will remove all surplus wax and leave just enough on the calico. If it is found that this mixture is not quite sticky enough, a little more beeswax can be added. For ordinary budding, this waxed calico, after it is cool, may be doubled up and nicked along its edge at distances of about one-third of an inch. It is then unrolled and wound on a pointed stick. After nicking, it is readily torn each time a small strip is required, and by winding it on a pointed stick the latter can be easily stuck into the ground and the wax cloth in this way kept from contact with the dirt.

A bulletin describing in detail the operations of budding and grafting is obtainable from the Department of Agriculture; price 11d. posted.

Poultry Keeping in Country Districts.

V. H. BRANN, Poultry Instructor.

FOR economic reasons poultry-farming has become a specialised industry restricted mainly to the metropolitan area, the lower freights on the produce sent to the Sydney market, the better transport facilities and the permanent water supply being the principal factors which have caused this centralisation.

Whether it would be advisable to commence commercial poultry-farming at long distances from Sydney or Newcastle depends upon (1) the presence of a reliable local market for the produce, or (2) a lower cost of feeding which would compensate for the extra expenses incurred in sending the produce to market.

Within the wheat-growing areas and dairying districts the lower prices ruling for the principal poultry foodstuffs to some extent comuensate for the lower prices usually obtained for poultry products, and with proper management enable poultry-raising to be carried on more or less successfully. With the low prices ruling for wheat at the present time it is not surprising that farmers are paying more attention to poultry-keeping, and are anxious to increase the number of layers as a means of utilising a portion of the feed grown, which is almost valueless on the open market.

It is not desired to create an impression that poultry-farming is as profitable in country districts as it is nearer the main markets, or that good results can be obtained from poultry with inferior feed, but in this direction clean "chick wheat" is just as suitable for poultry as f.a.q. wheat, and poultry-farming would be a profitable means of absorbing this product. Unfortunately, the poor conditions under which poultry are often kept on many farms in country districts do not give the birds even a reasonable chance of returning a profit. Lack of knowledge on the part of the owner, young, old, and nondescript classes of poultry running together, irregular attention, haphazard systems of housing, and the ravages caused by parasites are the chief causes of failure.

Under present conditions most of the eggs produced in distant country districts and marketed in Sydney are a bugbear to the commercial poultry-farmer, because the quality is such that only low prices are paid for them and they interfere to some extent with the sale of local eggs. Thus not only does the country farmer not get a satisfactory price, but his product tends to lower the market for the producer who is dependent on the industry for a living.

By the adoption of better methods of keeping poultry and by regular collection and prompt marketing of eggs the country farmer who keeps poultry as a sideline could secure better returns and not affect the commercial poultry-farmer. In order to try and help the intending country egg producer to start on right lines and assist those already keeping poultry as a sideline the following advice is given.

Commencing Operations.

The best way to commence poultry-keeping is to purchase good breeding stock during the autumn in readiness for the hatching season from June to September. The alternative is to purchase day-old chicks from reputable breeders—only be assured that the stock is of reliable quality. White Leghorns, Black Orpingtons, or Langshans are the most satisfactory commercial breeds to keep.

When it is desired only to keep a small flock, natural methods of incubation and rearing would be all that are required. In this case it would be necessary to keep one of the heavy dual-purpose breeds (Black Orpingtons or Langshans) for hatching and rearing. The difficulty, however, is to secure broody hens in the early and better part of the hatching season, which is the disadvantage of this system. For the maintenance of larger flocks it is desirable to install incubators and brooders for the hatching and rearing of the chicks. It is better to purchase two or three incubators of small capacity (120 to 140 eggs) than one of a larger size, owing to the inadvisability of keeping eggs longer than seven days before placing them in the incubators.

Rearing.

Efficient and adequate brooding accommodation is of vital importance in the plant on a poultry farm. Failure to raise each season sufficient pullets to replace at least half the number of layers being kept, thus eliminating birds in their third year which are no longer worth keeping, will be reflected in the egg production, especially during the autumn. Only well-grown pullets can be relied upon to produce when the older stock fall into moult during the autumn.

Whatever type of brooder is decided upon, the principles governing the successful raising of chickens are of course the same. The most important factors are that the brooder should be capable of maintaining a temperature of at least 90 deg. Fahr. when the chicks are first put in, and at the same time permit of ample ventilation, particularly as the chickens get older. A brooder to accommodate 100 chicks should have a floor space of approximately 8 square feet, and a run inside the brooder-house of at least 45 square feet. The number of chickens should be thinned down each week or two, so that at the end of six weeks it would be reduced to fifty. The temperature during this time should also be gradually reduced by 3 to 4 deg. a week, so that at six weeks the chickens can be weaned off the heat altogether and taught to roost as early as possible.

After this stage the sexes should be separated and the young birds placed out in runs not smaller than 100 feet by 150 feet, which is large enough for 150 head. Small colony houses (12 feet by 6 feet) with a height of 6 to 7 feet are the most satisfactory for this class of stock, and a house of this type will accommodate fifty birds. Three or more of these houses can be placed in one yard, and the birds can be trained to go back

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to their own particular house by enclosing them around the house with a small portable yard for one week before allowing them to run together on free range.

Young stock do exceptionally well if kept under this system until they mature, when they can be transferred to the laying quarters The yards they came from should be given at least three months' spell before receiving the new season's stock.

Housing Adult Stock.

The most satisfactory type of house for laying stock, particularly in cold districts, is the semi-intensive, in which provision is made for roosting accommodation and about half of the house is devoted to scratching litter to keep the birds active when shut in during bad weather. This system, if worked properly, will give better egg production in the winter time than ordinary houses for roosting only. It is essential that such houses should have a concrete floor and that a good depth of scratching litter, such as straw or grass, &c., be kept in the portion provided for that purpose. The birds should be shut in at night and kept in during cold weather. A regular practice should also be made of feeding the evening meal in the litter.

A suitable size for this class of house to accommodate 150 layers is 22 feet long, 14 to 16 feet wide, 6 feet 6 inches high at the back and 8 feet 6 inches at the front. To carry 150 birds, four perches running the full length of the house are necessary, and these should be all on the same level, 15 inches from the back wall and at least 20 inches apart. On no account should they be placed one above the other like steps, as this will cause crowding on the highest perch. The perches should be made of 3 inch by 2 inch timber, with the wide surface for the birds to roost on. The run for a house of this size should be at least 65 feet wide by 130 feet long.

For those who do not desire to erect such expensive houses, or where the climate is mild, a "roosting only" type of house might be adopted. A house of this class to accommodate 150 birds should be 30 feet long by 8 feet wide, 6 feet high at the back and 7 feet in front. The front should be boarded up to a height of 3 feet from the bottom and the nests placed along the front. Three perches the full length of the house are necessary and they should be spaced as described for the semi-intensive house. In this system a larger run is required, and it should be not less than 100 feet wide by 150 feet long. If a larger run can be provided, so much the better.

Further Points in Housing.

Overcrowding of poultry-houses and insufficient range are common reasons for poor development and production from poultry. Contaminated and foul land arising from keeping poultry under conditions too confined result in outbreaks of contagious diseases.

In estimating the area of land and size of house required for a flock, at least 60 square feet per bird should be allowed for semi-intensive runs and 100 square feet of yard space for the "roosting only" system. In the house 7 inches of perching room should be allowed for each bird.

Other important points in the construction of poultry-houses and yards are:—

(1) Poultry-houses should face north and must be adequately ventilated, yet not draughty. A house with an open front should have an aperture of not less than 4 inches along the top of the back wall to provide circulation of fresh air. Houses longer than 30 feet should be partitioned to prevent strong winds sweeping along the house.

(2) Rough timber, particularly for roosts, is undesirable and renders effective spraying for parasites very difficult.

(3) Houses that are too low are inconvenient and subject to rapid changes of temperature. Five feet is the minimum height for any poultry-house, but wide houses should be at least 6 feet high at the back.

(4) Fowl-houses should not join other structures, wooden fences, or be within 20 feet of trees. Moreover, every care should be exercised to ensure that all birds roost in the houses provided for them. Painting the woodwork with wood preserving oil is a safeguard against parasitic infestation. Limewash is worthless, and with continued application will eventually form a harbour for parasites.

Plans of the various buildings necessary for different classes of poultry are available on loan, upon application to the Under-Secretary, Department of Agriculture, Box 30A, G.P.O., Sydney.

Feeding.

Many people keeping poultry in a small way are in doubt as to the correct methods of feeding and often resort to expensive additions to the ration in order to increase egg production. It should be understood, however, that the main considerations are a properly balanced ration and careful feeding. The ration recommended by the Department, which is also fed to the birds in the Hawkesbury Agricultural College Laying Competition and gives excellent results, is as shown below (Ration No. 1), but substitute rations (Nos. 2, 3, and 4) may be adopted when supplies of the ingredients are available and are more economical to use.

MASHES FOR MORNING FEED.

Ration No. 1.

	lb.
Pollard	12
Bran	4
Lucerne chaff	3
Meat meal	1
Common salt	¼

Ration No. 2.

Wheat meal	10
Pollard	5
Bran	4
Meat meal	1
Common salt	¼

Ration No. 3.

	lb.
Pollard	10
Maize meal...	2
Lucerne chaff	3
Bran	4
Meat meal	1
Common salt	¼

Ration No. 4.

Wheat meal	9
Pollard	4
Bran	3
Lucerne chaff	3
Meat meal	1
Common salt	¼

The evening feed should consist of wheat and maize, or where available cheaply, oats may also be included to the extent of one-third.

The rations given above would be improved by mixing with skim-milk. Where a large quantity of skim-milk is available it would be very beneficial to use the milk curds to mix the mash. If this method is adopted the meat meal recommended in each ration may be reduced to ½ lb. One gallon of milk or water or approximately 1½ gallons of milk curds will mix 20 lb. of mash, which should be of a wet but crumbly consistency. The common salt should be thoroughly dissolved in the liquid with which the mash is mixed. Only lucerne chaff that is well cured and of good quality should be used.

The rations could also consist of up to 25 per cent. by weight of the total ration of chaffed green succulent lucerne or barley. In this case the lucerne chaff should be omitted from the ration. The best practice, however, is to feed the green stuff as a supplementary feed at midday.

For chickens under twelve weeks old the meat meal should be replaced by bone meal. Here again the lucerne chaff is better displaced by extra bran.

For the evening meal, the general practice is to use a mixture of wheat and maize in proportions according to the price, but in some localities the use of both grains is not always economical, in which case either wheat or maize can be fed alone if desired without seriously affecting the results.

Sudden changes of feeding, however, must be avoided; this is an entirely different matter to giving a variety of suitable foods in a set ration. It is an advantage to feed a little maize to breeding stock during the breeding season.

Shell grit should always be available to the birds.

MISLEADING INFORMATION RE NEWCASTLE DISEASE IN FOWLS.

MR. MAX HENRY, Chief Veterinary Surgeon of the Department of Agriculture, has drawn attention to some very misleading information that is being disseminated regarding Newcastle disease in fowls. In one instance a firm of "mail order specialists" is advertising a remedy for the condition, which is described as the same thing as fowl cholera, and is stated to have wiped out many poultry yards in country districts. As a matter of fact, Newcastle disease has no connection whatever with fowl cholera, it has not been reported from any place in New South Wales, and there is no medical remedy known which will check it in any way. Great caution should be exercised in accepting statements regarding the methods of treatment of these virus diseases.

F.A.Q. AND SECOND-GRADE WHEAT STANDARDS FOR 1931.

SUBSEQUENT to fixing the f.a.q. standard at 59½ lb. per Imperial bushel, the grain trade section of the Chamber of Commerce fixed the standard for second-grade wheat in bags at 56½ lb. a bushel. The second-grade sample is described officially as of milling quality, bleached and free from any commercially objectionable odour.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Kinross Bros., Minnamurra, Inverell (Geurnseys)	72	11 Feb., 1931
Miss Brennan, Arrankamp, Bowral	10	19 ,, 1931
Department of Education, Yanco Agricultural High School	33	21 ,, 1931
Lunacy Department, Parramatta Mental Hospital	89	23 ,, 1931
G. A. Parish, Jerseyland, Berry	103	27 ,, 1931
Lunacy Department, Kenmore Mental Mospital	76	28 ,, 1931
W. M. McLean, Five Islands Rd., Unanderra...	73	30 ,, 1931
Hawkesbury Agricultural College (Jerseys)	160	1 Mar., 1931
St. Joseph's Girls' Orphanage, Kenmore	10	3 ,, 1931
St. Michael's Novitiate, Goulburn	5	3 ,, 1931
Kyeng School, Moss Vale	8	4 ,, 1931
St. Joseph's Convent, Reynold-street, Goulburn	4	4 ,, 1931
St. John's Boys Orphanage, Goulburn	7	5 ,, 1931
Marion Hill Convent of Mercy, Goulburn	10	6 ,, 1931
Cowra Experiment Farm	29	6 ,, 1931
Riverina Welfare Farm, Yanco ...	69	6 ,, 1931
James Wilkins, Jerseyville, Muswellbrook	51	12 ,, 1931
Tudor House School, Moss Vale...	8	21 ,, 1931
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	202	3 April, 1931
Grafton Experiment Farm (Ayrshires)	180	5 ,, 1931
Department of Education, Hurlstone Agricultural High School	45	10 ,, 1931
Navua Ltd., Grose Wold, via Richmond (Jerseys)	13	29 ,, 1931
Australian Missionary College, Cooranbong	45	30 ,, 1931
J. P. McQuillan, Bethungra Hotel, Bethungra	6	1 May, 1931
George Rose, Aylmerton	4	28 ,, 1931
William Thompson, Masonic School, Baulkham Hills	48	28 ,, 1931
Department of Education, Gosford Farm Homes	30	3 June, 1931
F. C. Kershaw, Macquarie House, Macquarie Fields ...	71	5 ,, 1931
P. Ubrihien, Corridgeree, Bega ...	114	6 ,, 1931
Gladesville Mental Hospital	42	25 ,, 1931
A. L. Logue, Thornbro, Muswellbrook ...	40	28 July, 1931
A. H. Webb, Quarry-road, Ryde	6	26 ,, 1931
A. Shaw, Barrington (Milking Shorthorns)	122	9 Aug., 1931
E. P. Perry, Nundorah, Parkville (Geurnseys)	22	13 ,, 1931
Wagga Experiment Farm (Jerseys)	55	14 ,, 1931
Sacred Heart Convent, Bowral ...	12	20 ,, 1931
St. Patrick's College, Goulburn ...	8	22 ,, 1931
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	46	22 ,, 1931
James McCormack, Tumut	111	29 ,, 1931
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	81	12 Sept., 1931
J. F. Dowe, "Woolomol," Tamworth ...	48	19 ,, 1931
S. L. Wills, Greendale Dairy, Cowra ...	87	19 ,, 1931
Wolaroi College, Orange ...	10	4 Oct., 1931
Riverstone Meat Co., Riverstone Meat Works, Riverstone ...	104	11 ,, 1931
E. S. Cameron, Big Plain, Narrandera...	28	14 ,, 1931
T. L. W. Barton, Wallerawang ...	17	17 ,, 1931
J. F. Chaffey, Glen Innes (Ayrshires) ...	75	17 ,, 1931
Newington State Hospital and Home ...	108	24 ,, 1931
Lunacy Department, Callan Park Mental Hospital ...	29	18 Nov., 1931
J. Davies, Puen Buen, Scone (Jerseys)	85	14 ,, 1931
Wollongbar Experiment Farm, Lismore (Guernseys)	129	21 ,, 1931
Tamworth District Hospital	7	24 ,, 1931
Department of Education, Brush Farm, Eastwood ...	6	9 Dec., 1931
Bathurst Experiment Farm (Jerseys) ...	21	16 ,, 1931
H. A. Corderoy, Wyuna Park, Comboyne (Geurnseys)	59	8 Jan., 1932
New England Girls' Grammar School, Armidale	29	10 ,, 1932
C. J. Parbery, Allawah, Bega ...	119	10 ,, 1932
New England Experiment Farm, Glen Innes (Ayrshires) ...	87	12 ,, 1932
R. C. Dickson, Elwaton, Castle Hill (Jerseys)	17	20 ,, 1932
Lunacy Department, Morisset Mental Hospital	22	28 ,, 1932
Lidcombe State Hospital and Home ...	146	11 Feb., 1932

—MAX HENRY, Chief Veterinary Surgeon.

IT is in the interests of both the livestock industry and the wheat grower that considerable quantities of wheat be fed to stock this year.

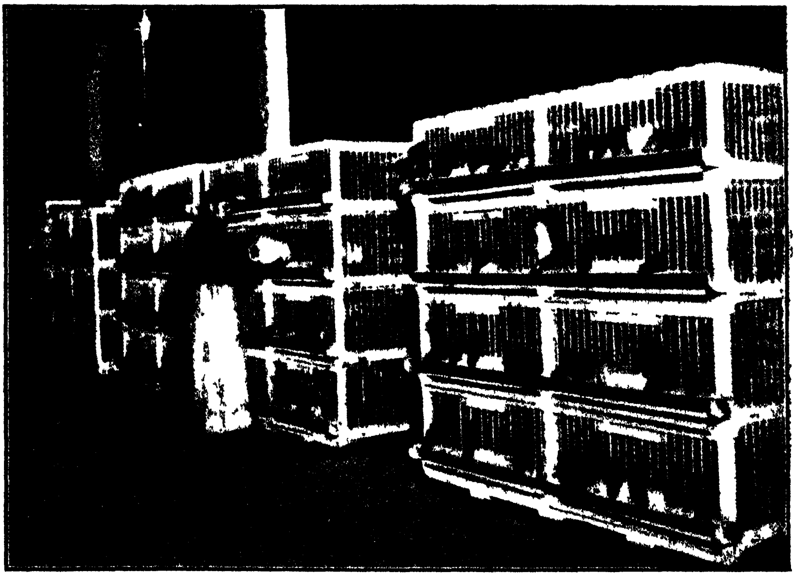
Poultry Notes.

MARCH.

E. HADLINGTON, Poultry Expert.

Methods of Handling Table Poultry in other Countries.

THE handling of table poultry is carried out much more systematically in Great Britain, Canada and America than is the case here, and in those countries there are numerous very large plants where poultry is fattened if necessary before killing. The general practice if the birds have any food in their crops is to starve them by omitting the first meal after they are placed in the crates. They are then fed lightly for the first few days, and a dose or two of Epsom salts are given during this time. Afterwards they are supplied with as much food as they will eat in two feeds per day, except in the summer time, when the days are very long and they may be given three feeds.



One Type of Fattening Battery.

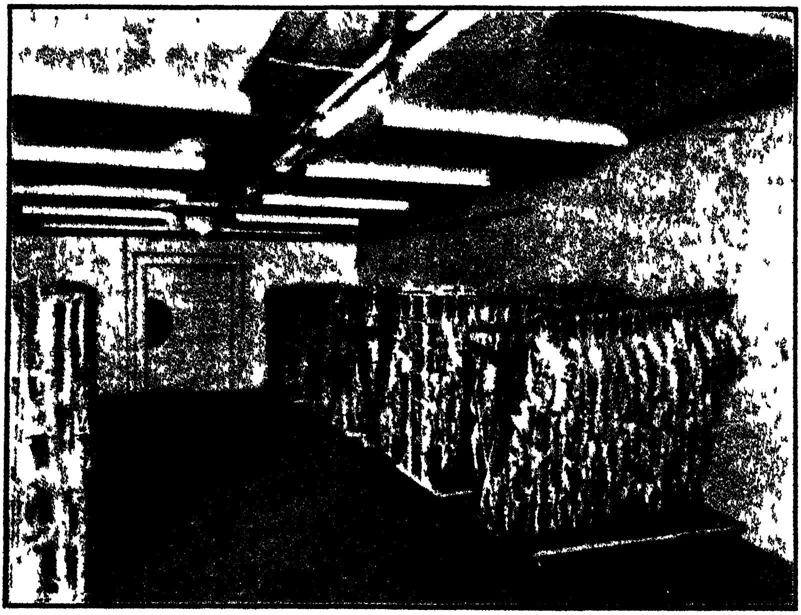
[*U.S.A. Dept Agric. photo.*

All soft food is given, and in some cases this consists of finely-ground grains such as wheat, corn, oats, barley, and also pollard mixed to the consistency of porridge, so that it can be poured into the troughs. Semi-solid buttermilk or buttermilk powder dissolved in water is regarded as the most satisfactory mixing agent, next to which comes skim-milk. It is considered that the best results are obtained by allowing the skim-milk to sour before using it to mix the food.

Fattening Period.

The time the birds are kept in the fattening batteries depends upon a number of factors, but the usual period is from one to three weeks. In Canada it is considered that two to three weeks are necessary to change the texture of the flesh, but it is found that some birds will not stand more than ten days' confinement. The deciding factor is whether the birds continue to eat well; if they go off their food they are taken out for killing at once.

Various kinds of batteries are used, but a popular type appears to be one four tiers high, the compartments usually being 24 inches long, 16 inches wide and 20 inches high, to accommodate four adult birds in each.



Poultry Hanging on Racks in Chilling Room to Reduce Body Heat.

The head of each bird is wrapped in paper.

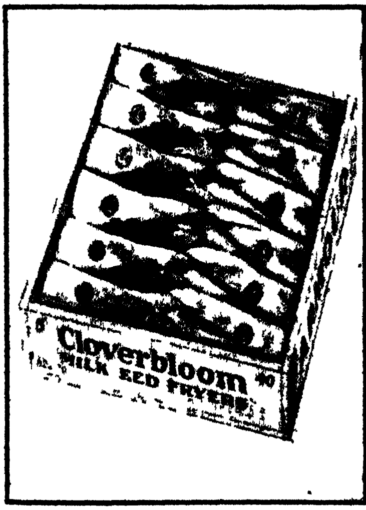
[*U S A Dept. Agric photo.*

In some cases the batteries are constructed in sections of eight compartments and are fitted with wheels so that they can be moved to any position desired. Materials for construction vary, some being built with wooden frames and wire-rod sides and fronts, but others are made with angle-iron frames and wire rods for sides, &c. The floors are of stout gauge wire, and trays are fitted underneath for cleaning out.

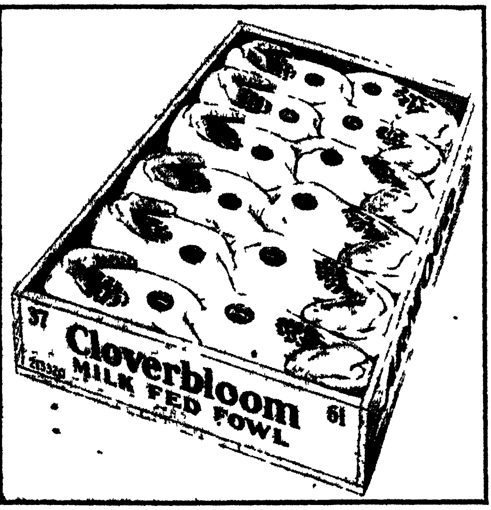
In Canada it is estimated that the average cost of growing a bird to maturity is 4d. per lb., and by crate-fattening another pound can be added at a cost of 3d. per pound, a lot depending, of course, upon the condition of the birds before fattening. In Northern Ireland, however, where experiments have been carried out by taking birds from free range and on the one hand battery-feeding them before killing, and on the other killing them direct, the results were in favour of the latter method. The experiments led to the conclusion that if poultry were reared under proper conditions to obtain the maximum development there is no necessity for the expense of battery-fattening before killing. This confirms our experience here in connection with the marketing of cockerels. It has frequently been pointed out that if poultry farmers would pay more attention to the proper rearing of their cockerels, they could make them pay well instead of being an economic loss, which is largely the case at the present time.

Dressing Poultry for Market.

In America much of the poultry killing is done by sticking, and this method is used for all birds intended for storage. The sticking is done with a special knife which is inserted through the mouth to sever the jugular vein, after which the brain is pierced. On some of the Swift plants in America the birds are killed and placed on a travelling chain which takes ninety seconds to reach the scalding vat. They are then immersed in water at a temperature of 126 to 130 deg. Fahr. for thirty-five seconds, the heat of the water being controlled by a thermostat. After the feathers have been removed, the birds are singed and dropped in flowing cold water for about ten minutes, the internal temperature in that time being reduced to about 90 degrees; the birds are then hung on racks to dry, after which they are placed in a cooler at 35 deg. for twenty-four hours before packing. Birds intended for storage or transport are not drawn.



Breast-up Pack.
Birds packed breast up with legs interlaced



Flat Pack.
Birds packed on sides.

At Armours' works a similar system is followed, but there is a slight difference in the temperature of the water for scalding and the time the birds remain in the water, the temperature adopted for the water being 125 to 126 deg. and the time of immersion from thirty to forty-five seconds, according to the age of the birds. The same procedure is followed with regard to cooling in cold water and allowing the birds to drain before going into the cooler (at a temperature of 32 to 35 deg.). No birds are packed until the internal temperature has been reduced to 34 degrees. The internal temperature is taken in some of the largest birds. When the birds are intended for storage for any length of time they are packed into cases after chilling and the cases are placed in the freezing room, preferably 5 to 10 deg. below zero; it requires seventy-two to ninety-six hours, according to the size of the birds and how they are packed, for them to become frozen The cases are stacked in the freezing chamber with 1-inch strips of wood between them for circulation of air, and a similar space is allowed between the stacks. When it is intended to store for long periods the boxes are stacked solidly after freezing. When birds are being despatched over long distances by rail they are packed in iced cars. Crushed ice and 12 per cent. of salt is used for shipments in the summer; in the cooler weather only 10 per cent. of salt is used. The cars are iced long enough before loading to have the temperature down to 32 to 35 deg., and this temperature is maintained during transit. It is not necessary to have the birds frozen for shipment. They can be taken out of the room in which the temperature is 32 to 35 deg., and when they have been hard chilled at 5 to 10 deg. below zero they are transferred to a holding room at a temperature of 28 to 30 deg. before being loaded into the cars.

In packing the birds for storage the heads are wrapped in parchment paper and the cases are lined with double paraffin-waxed parchment paper. The darkness of skin sometimes seen in stored birds is said to be due to not reducing the animal heat quickly enough.

Fluctuations in temperature at any stage during storage is harmful and causes sweating, mould development, and loss of bloom, and affects the eating quality of the birds.

Canning Poultry.

In some of the large poultry-farming centres of America canning of poultry is carried out, and one of these plants was inspected at Bellingham, where a branch of the Washington Co-operative Egg and Poultry Society handles the canning of hens and chickens.

The birds are purchased by weight and fattened for eight days before killing. The killing is done by sticking, and the birds to be canned are hard-scalded, but those for local trade are plucked by the semi-scald method. After scalding, singeing is done while the birds are wet; they are then scrubbed, scraped, and washed, after which they are cut up, the different parts, such as legs, wings and breasts being kept separate. The parts are then steamed and baked, the bones are taken out, and the different cuts are packed into cans. Hot soup is added and the cans are passed along conveyors to the clamping machine, after which they are washed in another machine with soap and water, then in clean water, after which they are placed in crates which are lowered into live steam cookers for a second cooking. When cooked, they are cooled down in cold running water. The pickings from the trunks of the birds are packed in cans with noodles made of egg and flour, and are sold as "chicken noodles." Chicken broth is also canned. Half pound cans of roast chicken sell at 2s. 3d., and 1 lb. cans at 4s. 2d. The cans are packed in cardboard boxes which are put together at the cannery.

I was informed that there is not a large demand for canned chicken owing to the cheapness of fresh dressed poultry.

Standards and Grades for Dressed Poultry.

During the past few years an attempt has been made in Britain, Canada and America to establish definite standards and grades for dressed poultry with a view to improvement in quality and thus an increase in consumption. In Britain standards have been adopted under the National Marks Scheme, and in Canada grading is compulsory for export shipments, and since my return the "Canadian Standards for Dressed Poultry" or "National Government Grades" have been adopted as the standard for home trading. Standards are provided for the following classes and grades of poultry, and also for turkeys, ducks, geese, pigeons and guinea fowls:—

Kinds.	Sub-kinds.
Chickens	Squab broilers, broilers, fryers, roasters, poulards, capons, stags.
Fowl	Hens, roosters.

The definitions of the various classes of poultry are as under:—

Chickens are young birds with soft, flexible cartilage at the end of the breastbone or keel. They are birds that are prepared for market and killed at or before maturity.

Squab broilers are young chickens weighing not more than 28 lb. to the dozen.

Fryers are chickens weighing from 29 to 42 lb. per dozen.

Roasters are chickens weighing 43 lb. and over per dozen.

Poulards are unsexed female chickens.

Capons are unsexed male chickens.

Stags are male chickens showing hard spurs and general characteristics approaching the rooster class.

Fowl.—Birds that have no soft flexible cartilage at the end of the breast bone or keel. They are birds that have come to maturity or that have been used for breeding purposes.

The different grades are:—

Milk-fed Special, Milk-fed "A," Milk-fed "B," Special, "A," "B," "C," "D."

Definitions of Grades.

Special.—Birds in this class are commercially perfect specimens as to conformation, finish, plumpness, and fine soft quality of fleshing. The back, hips, and pin bones must be well covered with fat. No bruises, breaks, nor tears in the skin or flesh are allowed, and no pin feathers that detract from the appearance of the bird. In no case shall pin feathers appear on the breast or the thighs. There must not be any evidence of discolouration from improper bleeding or from rubbing in plucking.

Milk-fed Special.—Milk-fed Special birds must comply with the description of Special and must, in addition, conform to the requirements of Milk-fed.

" A " Grade.—Birds in this class must be well fatted and fleshed, having backs, hips, and pin bones covered with fat. They may show some pin feathers other than on the breast. No deformities of any kind in conformation are allowable. There must not be any evidence of discolouration from improper bleeding or from rubbing in plucking. Tears in the skin are not to exceed half an inch in length, and there shall be no more than two tears on any one specimen, none of which shall appear on the breast.

Milk-fed " A."—Milk-fed " A " birds must comply with the definition of " A " Grade and must, in addition, conform to the requirements of Milk-fed.

" B " Grade.—Birds in this class must be reasonably well fleshed. They may show slight traces of pin feathers on the breast. No deformities are allowable except slightly crooked breast bones. They may show one large tear not exceeding 1 inch in length or not more than five smaller tears or slight traces of rubbing.

Milk-fed " B."—Milk-fed " B " birds must comply with the definition of " B " Grade and must, in addition, conform to the requirements of Milk-fed.

" C " Grade.—Birds in this class must be fairly well fleshed. They may be pin feathery, and they may be poorly dressed, torn, or bruised. This grade may contain: Birds with deformed breast bones, well fleshed birds improperly bled but which are not badly discoloured from improper bleeding, well fleshed birds with back and pin bones not covered with fat, and large, rangy birds that are not properly fleshed.

" D " Grade.—Very poorly-fleshed birds and all other birds below " C " Grade that are fit for human food.

Directions are given for the killing and dressing, method of packing, branding, &c., and provision is made for official inspection, and if up to standard they may be marked with the Government mark in accordance with the regulations. The Inspector examines at least 5 per cent. of each grade to be marked, and no Government mark is applied unless the warehouse or rooms in which the poultry is held are in a clean, sanitary condition, and facilities are provided for proper examination by Government inspectors.

American Standards.

Last year the Department of Agriculture in America issued tentative grading standards for the classification of dressed poultry on similar lines to those adopted in Canada. In issuing the proposed standards suggestions were invited for any improvements which would assist the scheme. After the "trade" and industry generally have become familiarised with the suggested grading, it is intended, after making any necessary alterations, to lay down official standards for the whole trade.

Necessity for Grading in New South Wales.

Anyone who has had experience in buying dressed poultry in our shops must be convinced that the time is overdue for the introduction of some such standards here. The fact that in most of our shops it is not possible to purchase any definite grade of poultry, and that very often old birds are sold as prime poultry, has the effect of greatly retarding the consumption of a valuable food commodity, and causes economic loss to poultry farmers. To say the least, our present methods of handling market poultry are uneconomic, unhygienic, and not in keeping with the progress and enlightenment of the twentieth century.

It is not suggested that a system so elaborate as those adopted in the other countries mentioned would be necessary here under present conditions, but a simplified scheme could well be devised for the general improvement in quality and classification of dressed poultry, which would create a better demand for what is now a doubtful luxury.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1931.

Bowraville (R. H. Usher)	Mar.	10, 11
Mudgee (T. P. Gallagher)	„	10, 11, 12
Cooma (G. E. Metcalfe)	„	11, 12
Dorrigo (A. C. Newman)	„	11, 12
Crookwell (A. G. McDonald)	„	12, 13, 14
Gresford (A. R. Brown)	„	13, 14
Bowral Horse Show (E. Waine)	„	13, 14
Campbelltown (R. A. Sidman)	„	13, 14
Rydal (H. Murray)	„	13, 14
Wingello (J. S. Creelman)	„	14
Nimbin (S. H. Kilmister)	„	18, 19
Macksville (G. Hughes)	„	18, 19
Dungog (W. H. Green)	„	18, 19, 20
Lithgow (E. L. Parker)	„	19, 20, 21
Camden (G. V. Sidman)	„	19, 20, 21
Goulburn (T. Higgins)	„	19, 20. 21
St. Ives (A. Pickering)	„	20, 21
Batlow (C. S. Gregory)	„	24, 25
Gundagai (P. J. Sullivan)	„	24, 25
Gloucester (L. Harris)	„	25, 26
Muswellbrook (R. C. Sawkins)	„	25, 26, 27
Brookvale	„	27, 28
Sydney Royal (G. C. Somerville)	Mar.	30 to April 8
Kempsey (E. Mitchell)	April	15, 16, 17
Stroud (C. E. Price)	„	17, 18
Orange (G. L. Williams)	„	21, 22, 23
Wingham (C. A. Blenkin)	„	22, 23
Grafton	„	22 to 25
Richmond (R. B. Tate)	„	23, 24, 25
Maclean (T. B. Notley)	„	29, 30
Wallamba (A. E. Carey)	April	30, May 1
Casino (H. J. Pollock)	May	5, 6, 7
Cootamundra Sheep Show (G. B. Black)	July	21, 22
Young Sheep Show (Thos. A. Tester)	„	29, 30
Peak Hill (W. Crush)	Aug.	4, 5
Trundle (W. P. Forrest)	„	18, 19
Lake Cargelligo (C. W. Hutchens)	„	18, 19
Illabo (J. McCarthy)	„	19
Condobolin (J. M. Cooney)	„	25, 26
Ungarie (D. R. Bedford)	„	26
Wagga (F. H. Croaker)	„	25, 26, 27
West Wyalong (A. Andrew)	Sept.	1, 2
Grenfell (P. Mylecharane)	„	1, 2
Murrumburrah (W. Worner)	„	1, 2
Bogan Gate (J. T. A'Beckett)	„	2
Burrowa (S. G. Hughston)	„	3, 4
Barmedman (S. S. Penberthy)	„	5
Young (Thos. A. Tester)	„	8, 9
Cowra (E. P. Todhunter)	„	15, 16
Temora (J. M. McInnes)	„	15, 16
Junee (G. W. Scrivener)	„	22, 23
Canowindra (W. E. Frost)	„	22, 23
Barellan (W. H. McRae)	„	23
Ardlethan (Les Smith)	„	30
Berrigan (R. Wardrop)	„	30
Hay (G. C. McCracken)	Sept.	30, Oct. 1
Narrandera (J. D. Newth)	Oct.	6, 7
Ariah Park (Mort Collings)	„	7
Quandialla (Stuart Tomkins)	„	7
Griffith (M. E. Sellin)	„	13, 14
Bribbaree (J. Aston)	„	14
Cootamundra (G. B. Black)	„	20, 21

Vine Manurial Trials.

THREE YEARS' RESULTS ON THE HUNTER RIVER.

H. L. MANUEL, Viticultural Expert.

FOR the last three seasons manurial trials have been conducted through the courtesy of Mr. M. O'Shea on his Mt. Pleasant vineyards at Pokolbin. This particular experiment is being conducted on a somewhat stony clay soil of rather poor nature on a steep slope facing north. The variety of vine is Aucerot.

When the experiment started in 1927, the vines were 12 years old. There are six plots, in which are included two check plots which have not received any application of manure. Each plot consists of five rows of twenty-five vines, 6 feet apart in rows, with the rows a similar distance apart. Between the plots three rows of vines are left without manure and treated as a separation area. Each plot is approximately one-tenth of an acre.

The plots were manured as follows:—(1) Superphosphate at the rate of 3 cwt. per acre; (2) sulphate of potash at the rate of 1½ cwt. per acre; (3) sulphate of ammonia at the rate of 1½ cwt. per acre; and (4) a complete manure consisting of superphosphate 2 cwt. per acre, sulphate of potash 1 cwt. per acre, and sulphate of ammonia 1 cwt. per acre. There were two check plots, one at the top and one at the bottom of the experiment area. Superphosphate was applied on 2nd August, and the other fertilisers on 10th September, after growth had started.

The 1927-28 Season.

Very little rain fell in the winter and early spring months of 1927, as may be seen from the following records:—

1927.	Points.	1927.	Points.
June ...	63	November ...	721
July ...	10	December ...	215
August...	31	1928.	
September ...	51	January ...	238
October ...	20	February ...	641

The weights of the grapes picked from each of the plots in 1927 were:—

YIELDS in 1927-28.

	lb.		lb.
No manure ...	409	Sulphate of potash ...	543
Complete manure ...	591	Sulphate of ammonia ...	492
Superphosphate ...	704	No manure ...	589

A comparison of these yields would lead one to assume that the fertilisers were able to function with beneficial results from the effects of the November, December, and January rains. Assuming this, and working out the results on a commercial and acre basis at £14 per ton—the price paid that year for grapes on the Hunter areas—the comparative increased return from superphosphate would be as follows:—

	t.	cwt.	qr.	lb.
Yield of superphosphate plot per acre	3	2	3	12
Yield of no manure plot (average) per acre	2	8	2	8
Increased yield of superphosphate plot	0	14	1	4

which, at £14 per ton = £10 = value of increase.

	£	s.	d.	£	s.	d.
Cost of superphosphate per ton	5	10	0			
Freight, per ton	1	0	0			
Total cost per ton	£6	10	0			
Cost for 3 cwt.				= 0	19	6
The net increased return per acre was thus	9	0	6			

The 1928-29 and 1929-30 Seasons.

In the 1928 season, unfortunately, a severe thunderstorm interfered with the results, and had an effect on the fruit-producing wood which carried the 1929 crop, but the figures for both seasons without a comparative basis are given below.

YIELDS in 1928 and 1929.

	1928. lb.	1929. lb.
No manure	104	169·5
Complete manure	90	200
Superphosphate	165	193
Sulphate of potash	56	186
Sulphate of ammonia	95	206

The rainfall in 1929 and 1930 was as follows:—

1929.	Points.	1929.	Points.
January	106	September	284
February	1,245	October	908
March	22	November	514
April	322	December	56
May	45	1930.	
June	96		
July	300	January	247
August	172	February	413

Looking over the results to date and considering that the 1928-1929 yields were affected by adverse weather conditions, it will be seen that the results are yet far from being definite, but it certainly appears that superphosphate is worthy of trial on soils of the kind on which the experiments are being conducted, especially as it is on the market at a fairly cheap rate.

NEW ZEALAND SWINE FEVER EMBARGO LIFTED.

INFORMATION has been received from the Director of Agriculture in New Zealand to the effect that, as a period of two years has elapsed since the last outbreak of swine fever in New South Wales, permits will now be issued by the Minister for Agriculture in New Zealand to persons desirous of importing pigs from New South Wales into the Dominion.

Orchard Notes.

MARCH.

C. G. SAVAGE and R. J. BENTON.

Treatment of Scale Insects on Citrus Trees.

THOUGH the season for treating scale insects on citrus trees is rapidly passing, and difficulty will now be experienced in freeing the fruit of scale, both fumigation and spraying may still be carried out for the extermination of these pests and increased vitality thus afforded the trees. The former is recommended, more particularly where red scale and white louse are present. Oil sprays are not sufficient in the case of the louse, but if thoroughly applied will control red scale.

It is frequently observed that in spraying trees, small areas are missed by the operator. This would appear to result mainly from holding the nozzle too close to the objective. For trees up to 8 or 9 feet high, better cover would be obtained by using a small bend on the end of the spray rod to enable an angle nozzle to spray at right angles, or the same result may be obtained if a quarter bend is used with a straight nozzle. With the spray issuing at right angles to the rod there is less likelihood of missing areas of the tree.

Green Manure Crops.

The sowing of seed of green manure crops should be expedited. Most crops sown early in March, owing to the slightly longer and warmer growing conditions, produce a greater bulk of organic matter, and reach sufficient maturity for ploughing under at an earlier date than crops sown at the end of March. Where peas have previously been used in coastal districts, a change to New Zealand lupins may be recommended. Purple vetch is also an excellent variety to use. For inland conditions Tick beans provide the best source of organic matter, and may be rotated with Grey field peas. Superphosphate at the rate of 1 cwt. per acre at least, should be applied to the crops mentioned at the time of sowing.

Last season's financial returns to growers were, in most instances, very disappointing, and as a result a reduced area of green cropping may be anticipated. Weeds will probably be relied on to furnish organic matter, and in such cases they may be encouraged to grow more luxuriantly by applying fertiliser, using a mixture of 1 cwt. superphosphate and ½ cwt. sulphate of ammonia per acre. The latter fertiliser may be omitted if it has been included in the fertiliser applied to the trees earlier in the season. Sulphate of ammonia makes a considerable difference to weed development, particularly to those of a non-leguminous type, while superphosphate encourages the trefoil, &c.

Re-soiling.

During the ensuing weeks a comparatively slack period may be anticipated in citrus groves, but for those growers situated where the soil is shallow or subject to erosion, the period may be profitably utilised by resoiling part, at least, of the orchard. Carting in bush scrapings—leaves, small sticks, grass, &c.—is a very valuable practice, while ploughing up and carting in the surface soil of adjoining paddocks may be resorted to.

Any pruning out of dead wood may be done, more particularly on trees carrying little crop, for there is some risk of scratching green fruit, thereby marring its appearance when mature.

Citrus Planting.

In localities not subject to severe frosts any refills required or new areas that have been prepared may be planted during the next few weeks. Refills should, as a rule, be of the same variety as the remainder of the bed. If the location is a wet one, the same variety worked on a more suitable stock should be procured to contend with the conditions, rather than the planting of a totally different variety.

Organisation.

Citrus growers in New South Wales have never, unfortunately, organised to any extent. Now that the Central Citrus Association has gone into liquidation owing to the irrigation areas packing houses deciding to conduct their own marketing arrangements, it is more desirable than ever that coastal growers should form organisations for the more economical distribution of their fruit. During this and next month growers in suitable localities—and there are many such—are urged to consider methods of organisation. A notable success in this direction was achieved last season by a number of Lisarow and Ourimbah growers, a limited number of whom, each producing good quality fruit, formed themselves into an association. Each packed his own fruit to specifications, but marketed the output under the association brand. There is great need for many more such bodies, which are very economically arranged and result in better returns for those incorporated.

The Bush Nut (*Macadamia ternifolia*).

Mr. H. Eastwood (Fruit Instructor) draws attention to the fact that although this is the main month for harvesting bush nuts, they should not be placed on the market immediately after picking, but sufficient time should be allowed for them to mature satisfactorily and develop their proper flavour and oil content. Some months is required for this process.

A big proportion of the nuts is disposed of as mixed nuts—mainly a Christmas trade line—and growers will find that the Macadamia nut is more readily disposed of and at generally better prices for this trade than at any other time of the year, which is another reason for holding the crop.

During harvesting is an opportune time to select seed for propagating purposes. Trees yield nuts varying in shape, size, thickness of shell, roughness of shell surface, and in other ways. Thinness of shell is an important factor, and trees which produce very thin-shelled nuts are scarce. Usually the thinner the shell the smaller the nut, and size is generally sacrificed when choosing the very thin shell type. A nut too small is not desirable, no matter how thin the shell may be. It is therefore necessary to consider thinness of shell and size of nut in conjunction, and select seed nuts of fair size and reasonable thinness in the shell. Any nuts with a shell that can be cracked with ordinary nut crackers should be regarded as satisfactory, and nuts of this type are usually of a good saleable size.

Plant the nuts soon after picking in pots or tins filled with good potting soil. Undue delay in planting will probably affect their vitality. Cover with about an inch of soil, water judiciously, and provide shade from the direct rays of the sun. The seedlings should be ready for transplanting the following spring and summer months.

Declining banana plantations might be inter-planted with the bush nut to advantage, and the trees will then be established when the bananas have gone out.

Leaf Spot Disease of Bananas.

This disease is likely to appear any time from now on, and to increase in severity as the weather gets colder. It is first seen in the older plantations—especially if they are located in low-lying and cold situations. The bottom leaves are first attacked, and as each succeeding leaf weakens it becomes a victim to the fungus. Eventually all the leaves may succumb, and the bunch be left hanging on a bare pseudo-stem.

All leaves which have finished functioning, as well as all diseased leaves, should be cut off and destroyed to decrease infection. Trashing of the plantation in this fashion, and correct cultural methods are the main practical means of control known at present, and should be commenced when the disease first shows up in the plantation.

The established idea that dead leaves should be allowed to remain around the stools during the winter months to act as a blanket and protect the plants from cold winds and weather conditions is difficult to substantiate and is losing favour among growers. Apart from the disease control aspect, trash around the stools prevents sunlight and air from getting to them, and these are all essential in the winter time for the proper development of the plants and bunches. Trash also smothers the suckers, and instead of strong, sturdy, well-formed followers, spindly, weak and stunted growth is likely to result.

THE latest recommendations of the Department of Agriculture of varieties suited to the different wheat-growing areas of the State are given in the pamphlet, "The Sowing of Wheat," which contains much other information of interest to the wheat-grower. Write to the Department, Box 36A, G.P.O., Sydney, for a copy.

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1st *April*, 1931.

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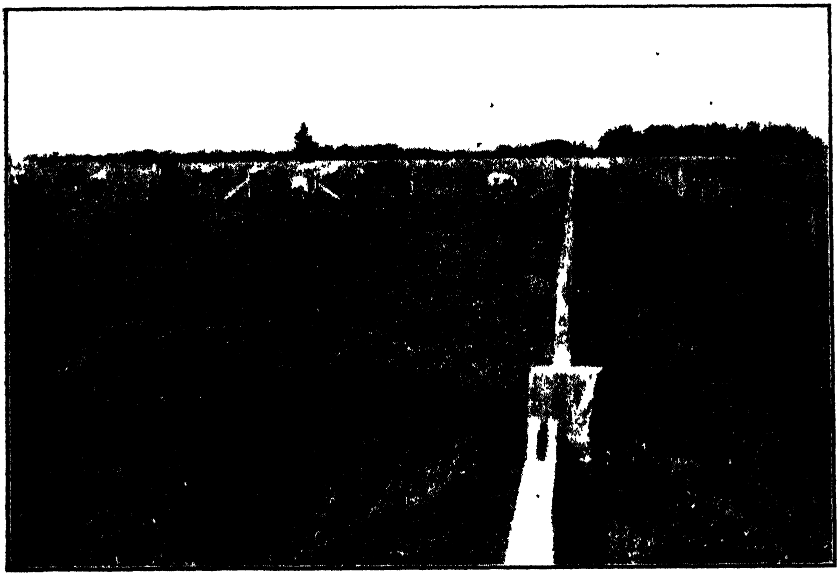
VOL. XLII. PART 4. APRIL 1, 1931.

Agricultural Gazette of New South Wales.

Intensive System of Grassland Management in Dairying Districts.

J. N. WHITTET, H.D.A., Agrostologist.

OF recent times much has been written on the advantages of adopting an intensive system of grassland management in dairying districts, and in this article is indicated the general lay-out, subdivision, treatment and size of paddocks, as well as the fertilisers and renovating implements used in this State.



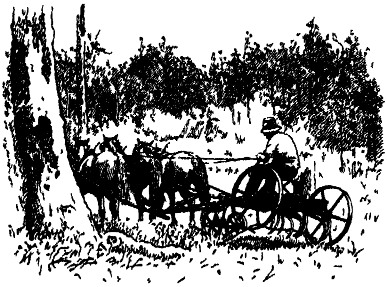
Adequate Subdivision with Paddocks Opening into a Central Race is Essential.

The "followers" are here seen cleaning up the feed left by the milkers which have been moved to fresh feed in the next paddock.

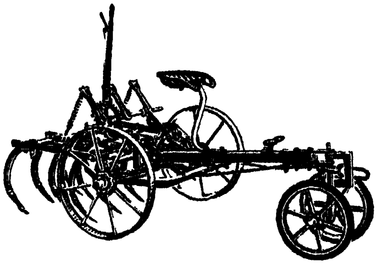
It has been demonstrated in other countries of the world, and particularly by Woodman and co-workers in Great Britain, that young, leafy pasturage has a very high feeding value and that when paddocks are maintained in good condition and closely grazed the high quality character of the feed is retained throughout the entire season. The fibre content of this class of feed is low in seasons of good to average rainfall, but in dry periods the quality of the feed diminishes, due to an increase in the fibre content as well as a reduction in protein. The trials at Berry Experiment Farm have shown, by chemical analyses, that the protein content of the dry matter of pasturage that has been intensively fertilised is higher than unmanured pasturage of a similar nature. This was particularly the case where nitrogen, phosphoric acid and lime were applied, and the areas so treated gave a higher butter-fat production and an increased carrying capacity compared with the other treated or untreated sections of the test. Such increases were due to the heavier yielding capacity and improved botanical and chemical composition of the pasturage.

Control of Feed.

An efficient system of rotational grazing in which the growth of pasturage is well controlled is the main essential on which the new system of grassland management is based. Unless this is carried out in its entirety the effect of fertiliser, and particularly nitrogenous fertilisers, will be considerably impaired.



A Stump-jump Paspalum Renovator.



A Non-stump-jump Paspalum Renovator.

Where stock cannot cope with the flushes of feed which occur in good seasons some paddocks should be closed to stock and the growth converted into grass silage or grass hay. Methods of handling and conserving this surplus feed will be found in the article on grass silage which appeared in the December, 1930, issue of this *Gazette*.

One of the chief aims of the intensive system of grassland management is to produce and feed to the milking cows pasturage 3 to 4 inches in length and of high quality, therefore, the animals are only allowed to graze sufficiently long on the paddocks to obtain the best of the feed, the material they leave being cleaned up by the "followers," which comprise dry cows, young stock or sheep. The period that the milking cows will occupy each paddock ranges from two to three days. Any rough feed rejected by the followers should be cut with the mowing machine. Remove the milking cows as soon as they have consumed the best of the feed, and on no account leave them on an area long enough to register a drop in their milk yield.

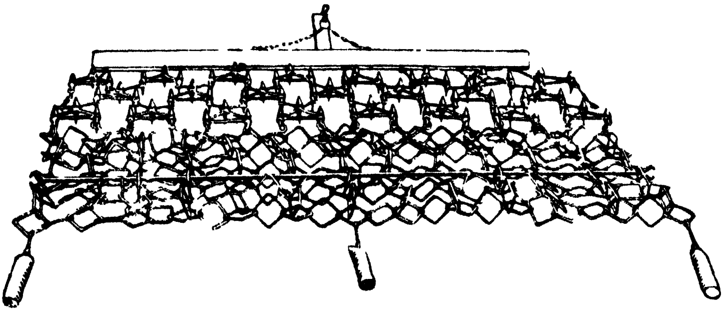
Renovating and Top-dressing Implements.

Many of the failures to obtain a satisfactory response to fertilisers on pastures, and particularly on sod-bound paspalum areas, have been due to the paddocks being in an unsuitable condition to produce results.

The first essential operation is to clean off any long growth of grass and dry trash from the paddocks. This is necessary, otherwise renovating implements and grass harrows will not do effective work. Areas require to be worked in the early autumn with a pasture cultivator, two types of which are now on the market, viz., (1) the semi-rigid tine, and (2) the stump-jump.

The amount of work necessary to renovate an area satisfactorily will depend on the condition of the pasture; in the case of badly sod-bound paspalum two workings from 3 to 5 inches deep will be required, the second working to be at right angles to the previous one.

Where lime is used, it should be spread with the fertiliser distributor a month before distributing the fertiliser. After the fertilisers are applied a pasture harrow should be run over the area to complete the work. Subsequent workings of the paddocks will be made with the pasture harrow after each grazing period, in order to distribute animal droppings, collect and remove dry grass, and create a soil mulch.



A Suitable Type of Grass Harrow.

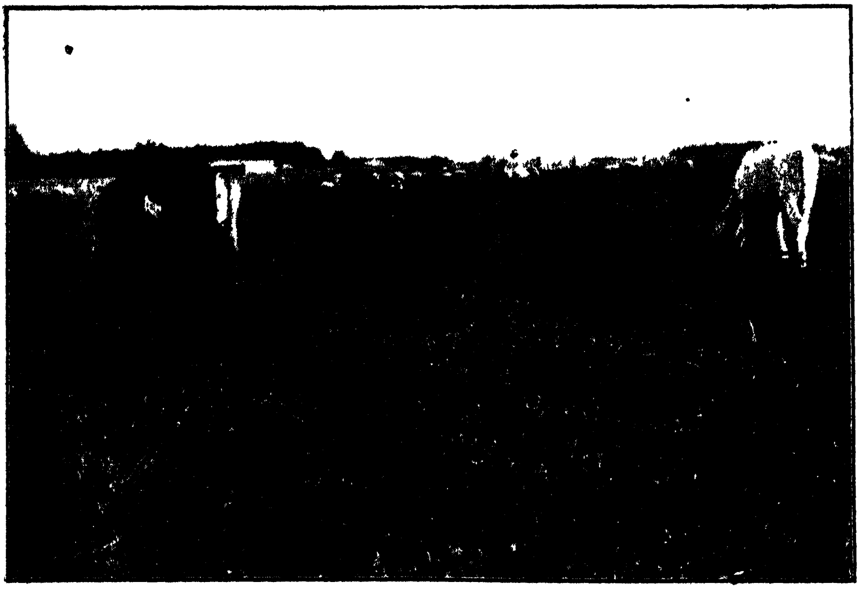
The harrowing of grassland with a tripod and chain pasture harrow after completion of each grazing period is necessary in order to break up and distribute animal droppings.

Subdivision of Paddocks.

The greater the number of small paddocks available, the greater will be the use made of the pasturage at its optimum stage of feeding growth. It has been demonstrated in England that grass cut at three-weekly intervals and analysed retains the non-lignified, highly digestible character which it possesses at the end of a week's or a fortnight's growth, and that this characteristic of high digestibility obtained by cutting at three-weekly intervals is maintained throughout the entire season.

By having a large number of small paddocks which can be rotationally and heavily grazed for about two days by the milking cows, and from two to three days by the followers, and then permitted a three to four weeks' spell before being grazed again, it is possible always to have available pasturage that retains its high digestibility and nutritive value, which makes it eminently suited to supply the food requirements of most farm animals. Moreover, in large paddocks considerable food wastage occurs on account of excessive tramping and fouling of the pastures by the stock.

The size of the paddocks will mainly depend on the number of milking cows to be grazed and on the fertility of the land. The figure generally adopted in our coastal districts for good paspalum-white clover areas is twelve cows per acre. A farmer milking on an average of sixty cows on this class of country would therefore require to subdivide into 5-acre paddocks in order to obtain proper control of growth and efficient utilisation of the pasturage.



Dry Stock and Sheep being used as "Followers."

To reduce the cost of subdividing paddocks, fences, consisting of three barbed wires, or the top wire plain and the two lower ones barbed, with posts 15 to 16 feet apart, can be used instead of erecting costly permanent lines of fencing, as it may be necessary at a later date to alter the general lay-out of the farm. Each paddock should open into a laneway, race, or long, comparatively narrow paddock that leads to the water supply. It is important that this area should be fairly wide, at least 50 feet, in order that the cows will not be herded together at any time in a narrow strip; this will reduce danger of injury through horning, &c., and also prevent the area becoming a bog in wet weather.

When commencing this system of grassland management, a start should be made with the most productive grass areas, gradually bringing other paddocks into the scheme. It is inadvisable to grass-farm intensively all the pasture paddocks on the holding until adequate fodder reserves of crop and grass silage or hay are built up to tide over dry periods and winter months.

The provision of suitable shade trees in the paddocks is most important; sufficient attention is not given to this essential work even in the large paddocks which are to be found on most of our dairy farms at the present time.

Fertilisers and Lime.

An application of 2 cwt. of superphosphate and 1 cwt. of sulphate of ammonia per acre should be made in the autumn of each year, preferably after a good fall of rain. A further dressing of nitrogen may be necessary in the early spring or summer months to stimulate extra growth of pasturage when it is most required. In some districts, a definite response to applications of potash has not been obtained. but where farmers are desirous of testing this fertiliser on small areas, 1 cwt. per acre of 30 per cent. potash salts should be used in conjunction with the superphosphate and sulphate of ammonia mixture mentioned above.

Lime is necessary on soils which are deficient in this ingredient, and should be applied at the rate of ½ to 1 ton per acre once every three years. A special grade of lime for pasture work is now manufactured in this State.

A deficiency of lime and phosphoric acid in pasturage is responsible for many troubles in live stock, particularly in our coastal districts. Supplying the pasture plants with mineral plant food will considerably assist in overcoming many of these deficiency disorders.

"TREE PLANTING ON THE FARM."

THIS booklet of seventy-three pages, including illustrations, has just been issued. The author is Mr. R. H. Anderson, B.Sc.Agr., Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, Sydney University.

The booklet contains sections on the uses of trees on farm and pastoral areas, principles of tree planting, improvement and regeneration of naturally occurring trees, the establishment of windbreaks and shelter belts, the farm tree-lot, and concludes with lists of recommended trees for different purposes in various districts.

No farmer or pastoralist can afford to be without the knowledge this little book will enable him to acquire.

Copies can be obtained from the Department of Agriculture, Box 36A, G.P.O., Sydney; price, 1s. 2d. posted.

Pasture Improvement at Adaminaby.

SUCCESS WITH LUCERNE AT 4,000 FEET ALTITUDE.

L. W. McLENNAN, B.Sc.Agr., Assistant Agrostologist.

ONE of the greatest developments in pasture improvement in New South Wales during recent years has been the extension of the areas of grazing lucerne into cold and dry localities and into districts of high altitude which were previously regarded as unsuitable Originally lucerne-growing was confined to river flats, but now it is almost as commonly grown on hillsides. In cold districts the hill lucerne is often superior to that grown on the flats, particularly in the winter.

The Adaminaby district offers an instructive example of this extension of lucerne-growing into cold districts of high altitude. Mr. L. Freebody, of "Bolairo View," has established what he claims to be the highest lucerne area in New South Wales; he has 200 acres growing at a height of nearly 4,000 feet. From the winter of 1929 to the winter of 1930 this area carried five to six sheep per acre. Mr. Freebody realises the necessity for subdividing his paddocks to permit of rotational grazing, and has accordingly divided his 200 acres of lucerne into ten paddocks ranging in size from 7 to 45 acres. These paddocks are grazed heavily and then spelled. A system whereby sufficient stock are used to eat the lucerne down to the crowns in one week and the stock then removed until the crop reaches the bud stage would be ideal and would result in considerably increasing the average carrying capacity. Though unable to follow this scheme exactly, Mr. Freebody approaches it as closely as unfavourable seasons permit. In most years hay is cut from some of the paddocks, whilst in seasons of abundant growth large supplies are cut, baled, and stacked as a drought reserve.

Details of Stocking of Lucerne Paddocks.

Records of the stocking of six paddocks were kept from autumn, 1929, to autumn, 1930. Though the average annual rainfall at "Bolairo View" is 22 inches, only 13½ inches fell during the period of the trial. Even under these dry conditions, a 30-acre paddock was cut and yielded 16 tons of prime hay. Natural pastures provided only a little dry grass, whilst green feed was available in the lucerne paddocks throughout the year. During the winter, which was one of the severest on record, when growth of the lucerne was slow, a fair shoot of barley grass amongst the lucerne helped considerably. In July and early August over 600 ewes were lambed on these paddocks with very few losses. During the summer 703 fat ewes and lambs were marketed. The ewes were aged, being unsaleable except as fats, and without the lucerne fattening would have been quite impossible.

Details of the stocking of these lucerne paddocks were as follows —

STOCKING of Lucerne Paddocks

Area	Date Sown	Period of Trial	Sheep Carried per acre during Period of Trial
acres			
10	September, 1924	15-4-29 to 15-5-30	*15·1
12	" 1927	13-3-29 to 13-3-30	2·9
7	" 1927	27-2-29 to 27-2-30	6·0
45	" 1927	12-4-29 to 12-4-30	4·2
34	" 1927	8-3-29 to 8-3-30	5·5
30	February, 1926	4-6-29 to 4-6-30	†2·9

* The sheep in this paddock had access to 80 acres of grass land which had previously been well eaten out and provided only a little rough grass.

† 11 cwt. hay per acre was cut from this paddock on 5th August, 1929.

An area of 5 acres of *Phalaris tuberosa* sown on a flat has grown very well, but the high cost of clearing, ploughing and seed prevents extension of this work. Under similar conditions Perenial Rye grass gives even better results. It grows excellently wherever sown on flats, and occurs naturally in many places on this property. Subterranean clover germinates well, but growth is very slow until late spring and summer, when it produces plenty of feed.

Of sown pasture plants, Mr. Freebody places entire reliance on lucerne and Perennial Rye grass. Most of the lucerne has been sown in the spring at the rate of 10 lb. per acre, but recent results indicate that early autumn sowing may be preferable, and that the seeding can be reduced to about 6 lb. per acre.

Further Successes with Sown Pastures and Top-dressing.

Mr. Herbert, of "Eucumbene," Adaminaby, has 8 acres of lucerne which were sown in 1927. When inspected in June, 1930, Mr. Herbert said that the lucerne had been heavily grazed all through the drought and at the time showed a 6- to 9-inch green shoot, whilst in other pastures growth had ceased. This paddock is situated on the side of a hill, and a remarkable feature is that the growth of lucerne improves from the bottom to the top of the hill.

Some years ago *Phalaris tuberosa,* Perennial Rye grass, Cocksfoot and other grasses were sown on this property. As at "Bolairo View," Perennial Rye flourishes on all flats and is favoured in preference to ***Phalaris tuberosa.***

In May, 1929, 90 acres of natural pasture were top-dressed with superphosphate at the rate of 1 cwt. per acre, and 2 lb. per acre of Subterranean clover seed was distributed with the fertiliser. At the time of application Wallaby grass predominated with a smattering of clovers. The fertiliser stimulated the growth of clovers, particularly Ball clover, and the stock showed a distinct preference for the top-dressed area. The Subterranean clover germinated well, but showed very little growth before September. The ability of Subterranean clover to withstand excessive cold was demonstrated by the fact that the young plants survived after the soil had been frozen for two months during the winter. In the summer the clover seeded fairly well, and in June, 1930, small plants appeared throughout the pasture. On the Southern Tablelands Subterranean clover is always slow in establishing itself when broadcasted, so that these results must be regarded as satisfactory. When early autumn rains occur Subterranean clover will make fair growth throughout the season, but when these rains are delayed the young plants make poor headway during the very severe winter months and produce little feed until late spring.

Top-dress in the Autumn with Superphosphate.

In autumn, 1929, Mr. G. Mackay, of "Hemsby," Adaminaby, top-dressed 50 acres of natural pasture with 1 cwt. superphosphate per acre. The fertiliser caused a very noticeable thickening up of the sward and proved a stimulus to clover growth, permitting a considerable increase in the number of stock carried.

This and other results of top-dressing trials conducted in the Adaminaby district indicate that where Wallaby grass and clover pastures occur, the application of superphosphate in the autumn is to be recommended.

Mr. Osborne, of "Bolairo," Adaminaby, has an area of 500 acres of lucerne sown at various times during the last twelve years which is continuously and heavily stocked. A mixture of Perennial Rye grass, Italian Rye grass, Cocksfoot, Red and White clover, sown on moist tussocky flats, has been found to be invaluable for fattening bullocks, providing a large bulk of feed in the winter when the lucerne paddocks show least growth. Mr. Osborne has sown several hundred acres to this mixture.

As at "Bolairo View" and "Eucumbene," the lucerne paddocks are cultivated in July or August of each year.

"MALLEE FARMING."

THE sparsity of reliable information of the subject of wheat-growing in mallee districts ensures that the recently issued booklet, "Mallee Farming," by E. S. Clayton, Senior Experimentalist of the Department of Agriculture, will be well received. There is no better authority on mallee farming in the State than the author, whose knowledge of the subject has been still further widened by his recent investigations of mallee farming in Victoria, South Australia, and Western Australia.

The booklet contains forty-three pages, is well illustrated, and includes a coloured crop map of New South Wales showing the location of the mallee areas. Chapters are devoted to a description of mallee timbers and soils, particularly those of the Roto-Euabalong mallee area. The suitability of this area from the point of view of rainfall is also discussed, while the general factors involved in the growing of wheat in dry areas is dealt with. The second-half of the work outlines the various operations in the working of a mallee farm.

Copies can be obtained from the Department of Agriculture, Box 36A, G.P.O., Sydney. Price, 8d. posted.

Varieties of Wheat in New South Wales.

[Continued from page 190.]

J. T. PRIDHAM, H.D.A., Plant Breeder, and A. R. CALLAGHAN, D.Phil., B.Sc., B.Sc.Agr., Assistant Plant Breeder.

THE following varieties have been described and illustrated in previous instalments of this article:—Waratah, Federation, Yandilla King, Turvey, Canberra, Nabawa, Bena, Marshall's No. 3, Penny, Hard Federation, Union, Free Gallipoli, Nizam, Currawa, Gresley, Wandilla, Ranee, Riverina, Cleveland, Purple Straw, and Aussie.

As in previous instalments, the varieties dealt with in this issue are in the order of their relative importance in New South Wales at the present time.

Bomen.

Bomen is a departmental crossbred of mainly Fife-Indian parentage. It was evolved by multiple crossing and the following parents were used in the course of its evolution:—Jonathan, Zaff, Power's Fife, and Red Potocka.

The early growth of Bomen is vigorous and semi-erect, accompanied by medium to good tillering. Prior to heading the foliage is erect, the leaf blades being only medium-long and stiff. Very even uniform growth is a characteristic of the variety in all stages. The straw is tall, fine and elastic with good standing qualities; it is notably tough and rather harsh. The glaucousness of the stems and leaves gives it a greyish-green colour prior to ripening.

The white, totally bald ears have particularly uniform spikelet arrangement; they are medium-long and distinctly tapering, with a slight tendency to shatter. The outer glumes of the spikelet are prominently keeled throughout their length; their rather narrow and very oblique shoulders are even more characteristic. The grain is red and belongs to the medium-strong class. The red grain excludes the variety from export, but it is still grown to some extent for local milling.

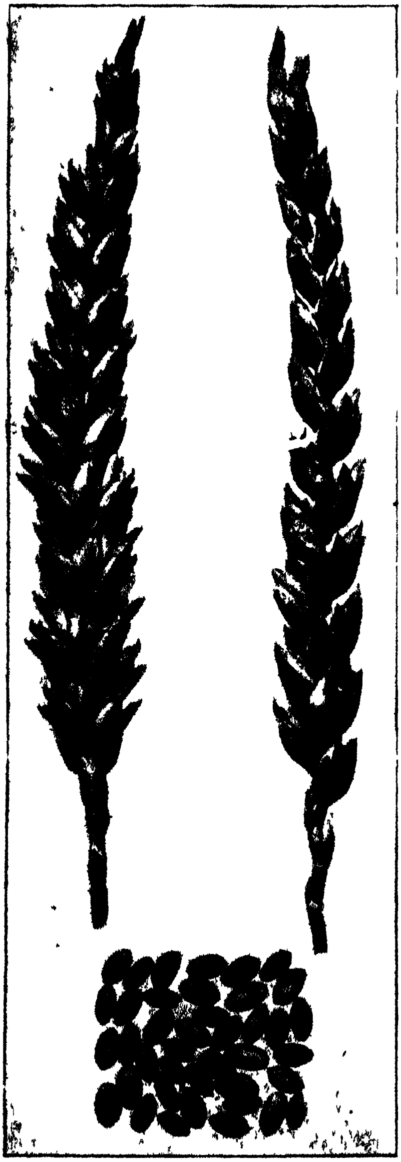
Bomen is highly resistant to flag smut and moderately resistant to rust and other diseases, and on account of this disease resistance, combined with productiveness, its culture was rapidly extending in the north-west and in the south, but since it has been regarded unsuitable for export this progress has been checked and its acreage receded. The figures show that it was grown to the extent of 73,640 acres in 1925, but by 1929 the acreage had dropped to 29,882.

It is a mid-season variety with many sterling qualities. For the latter reason it is now being used as a parent in attempts to transmit these qualities to a white-grained variety.

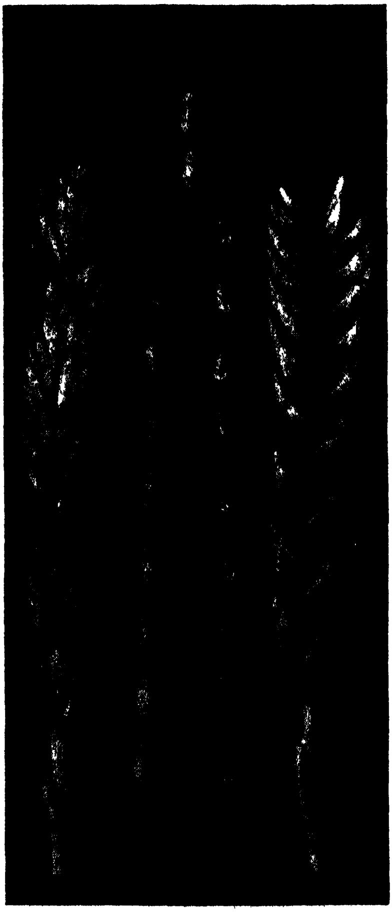
Major.

This wheat was bred at Dookie Agricultural College, Victoria, from a cross made between Federation and a purple-strawed variety called Wallace.

A vigorous stooler, Major is prostrate in early growth. It has white, somewhat coarse straw, of medium height and very strong. The broad, white, clubbed ear has short, minor tip-awns. The outer glumes of the spikelets are long, with narrow, oblique shoulders, which on those situated near the base of the ear are almost wanting. The shoulders of the variety Penny are also narrow and sloping, but the ear of this variety usually



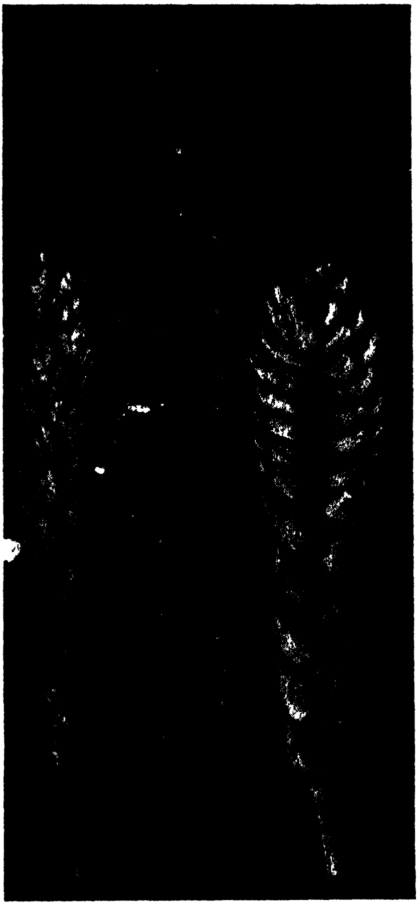
Pomen.



Major.

bears prominent tip-awns in contrast to the almost bald ear of Major. The shoulders of the outer glumes of Minister are elevated, those of Currawa rounded; these characters serve to distinguish these varieties from Major. There are also differences in grain characters; the grain of Major is smaller than Currawa without the hump-back, and whiter and softer than that of Minister. Major is included in the weak-flour class.

Gluyas Early.



Minister.

Major is highly susceptible to flag smut and susceptible to rust, but in spite of rust infection the grain seldom pinches badly. This variety is still very popular in Victoria and is also grown to some extent in the southern border districts of New South Wales. It is, however, of the same maturity as Yandilla King, and as it is extremely doubtful whether it is as productive under New South Wales conditions, Yandilla King is to be preferred.

Gluyas Early.

Gluyas Early was selected some forty years ago by a farmer in South Australia. It bears the name Gluyas after the farmer who selected it, but its general characters suggest that it was initially of Indian origin.

It is erect in early growth, with narrow leaves and only mediocre tillering capacity. At the heading stage the foliage is erect. The straw is slender, somewhat short, weak and generally apt to lodge.

The brown tip-awned ear is of medium length, but not very dense, each spikelet, however, generally fills three to four grains. In some respects it resembles Waratah, but the ear is slightly longer and has not the characteristic long divergent tip-awns of Waratah. A further difference is in the outer glumes of the spikelets; in Waratah they are rather short with square shoulders, whilst in Gluyas Early they are long with decidedly oblique shoulders. Gullen also resembles Gluyas Early in general appearance, but the pubescent outer glumes with elevated shoulders of Gullen make confusion of the two varieties impossible. The elongated yellow grain of Gluyas Early is classed in the weak-flour group. A tendency to shatter its grain when ripe is a defect.

Gluyas Early is very susceptible to flag smut, but comparatively resistant to stem rust. Its chief claim for notoriety is through its inherent productiveness and undoubted drought-resisting qualities. It has transmitted these qualities to Waratah and Nabawa, both of which varieties were bred with Gluyas Early as one of their parents. In view of the success already attained, cross-breeding work with this variety as one parent is being exploited further. It is the leading variety in South Australia, a position it has maintained since 1925. In New South Wales and Victoria, however, it has declined in favour in recent years, especially in this State, where it has been largely replaced by Waratah.

Minister.

Minister was produced in Victoria at Dookie Agricultural College by multiple crossbreeding, its pedigree being Dart's Imperial x Fife-Indian x Dart's Imperial.

It is a late-maturing variety with a prostrate habit of early growth and medium-tillering capacity It has rather short straw of only medium coarseness. The ears of Minister are short, white, tip-awned and definitely clubbed. Minister has elevated shoulders to the outer-glumes of its spikelets, a character which makes it readily distinguishable from other club-headed wheats like Penny, Major or Currawa. The grain is of medium size, flinty in appearance, and, like Hard Federation, is intermediate between the strong and medium-strong flour classes.

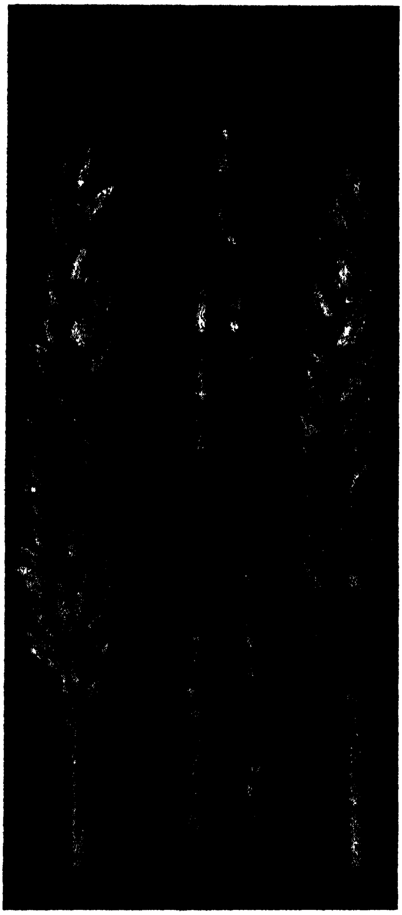
Minister is susceptible to flag smut and to stem rust. Under New South Wales conditions it does not yield as well as Yandilla King, and millers are seldom willing to pay a premium for its better quality grain. Although it is still grown in Victoria and in the southern districts of New South Wales, its popularity has decreased considerably in both States since 1925.

Bald Early.

Bald Early was originally selected by a Victorian farmer from the variety Improved Steinwedel.

It has tall, rather stout, purple-tinted straw and abundant foliage, with excellent hay qualities. The white ears are fusiform and awnless. The grain is soft and white with a decided pit in the crease. Bald Early does not shatter its grain like the parent variety, but at the same time it strips readily.

It is very susceptible to stem rust and susceptible to flag smut; one of its leading features, however, is drought-resistance, a quality inherited from its Steinwedel parent. Its high susceptibility to stem rust precludes it from being grown successfully on the near western slopes and tableland districts, but its excellent hay qualities, early maturity and drought-resistance make it popular in the far western districts.



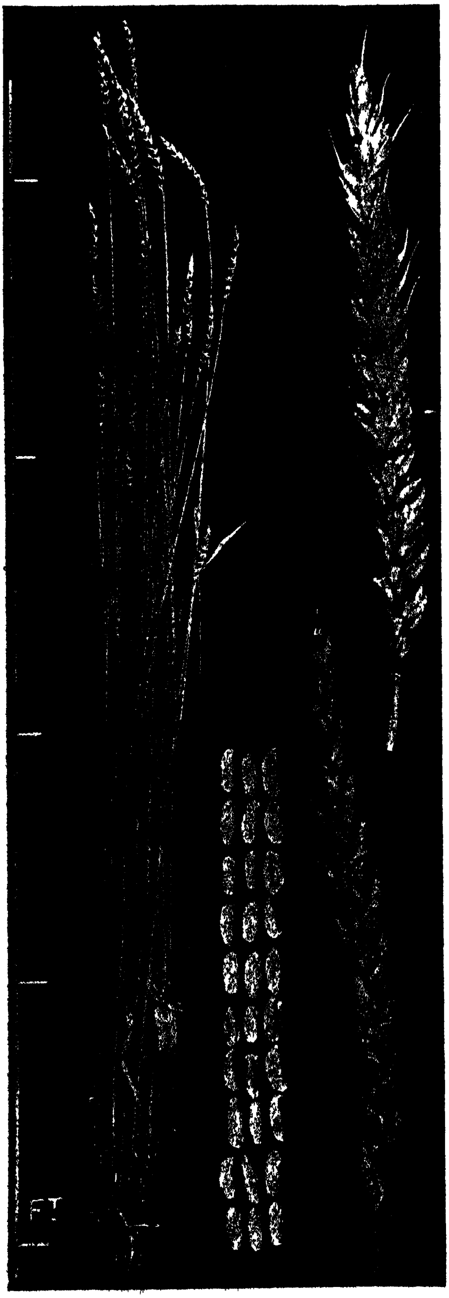
Bald Early.

Florence.

Florence is one of Farrer's multiple crossbreds, with the pedigree (White Naples x Improved Fife x White Naples) x (Improved Fife x Eden). The White Naples parent resembled the old variety White Lammas.

In early growth it is erect, tillers fairly well and grows compactly The foliage at heading time is a glaucous green and erect. The straw is medium tall to tall and fairly slender. Florence has white, tapering ears bearing minor tip-awns. The shoulders of the outer glumes are quite oblique and the grain is pitted; both these characters contrast with similar characters in Rymer, a variety that resembles Florence. The shoulders of the outer glumes of Rymer are square. The grain of Florence, although deeply-creased and pitted, is hard and flinty and lies between the medium strong and strong milling classes.

Florence is very subject to shattering; it is susceptible to flag smut, but somewhat resistant to stem rust. It was specially bred by Farrer for resistance to bunt, and to this disease it is very highly resistant. Although it is still grown to some extent in the far western districts, its popularity has waned considerably in recent years, chiefly because of its defect of shattering and partly because other varieties such as Clarendon and Firbank have superseded it as a hay wheat. It is recommended by the Department for the coastal districts both for hay and green fodder and as a dual purpose variety on the Northern Tablelands and the North-western Plains.



Florence.

Clarendon.

Clarendon is one of the last of Farrer's crossbreds, with the long pedigree Bobs x Gluyas x Jonathan x Eden x Jondhala, another example of the success of multiple crossing. The cross from which Clarendon was evolved was made in 1905 between Bobs and the strain Gluyas x Jonathan x (Eden x Jondhala). The variety was fixed at Hawkesbury Agricultural College, where selection was carried on with the main object of producing an early variety resistant to leaf rust and stem rust, suitable for coastal green fodder.

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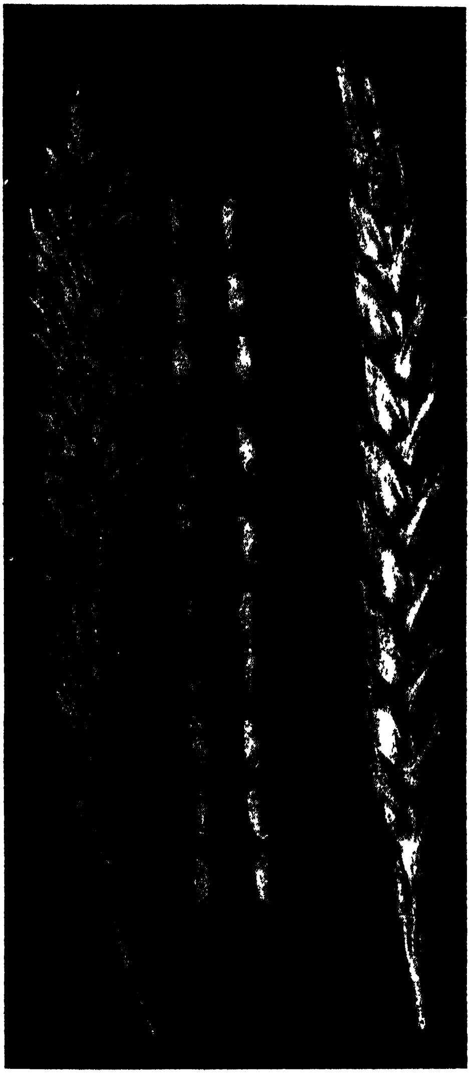
Clarendon is erect in early growth with only mediocre tillering capacity. The straw is medium-tall to tall, slender, and not very strong; it is satisfactory for hay purposes. The white tapering ear bears only minor tip-awns; it has a low density, and this, together with its very tapering character, contrasts with the denser and more compact heads of Cadia and Carinda. Further, the outer glumes of Clarendon have rounded shoulders, whilst in both Cadia and Carinda the shoulders are elevated. The grain of Clarendon is small, white, and classed in the medium-strong group.



Clarendon.

It is susceptible to flag smut, and, although not entirely resistant to leaf rust it is reasonably resistant under field conditions. This latter feature, together with its earliness and rapid growth, gives it priority over all other varieties as a green fodder wheat in coastal districts. Its very early maturity enables it to escape serious injury from stem rust, consequently it is in favour for late sowing on the North-western Slopes and on the Northern Tablelands. Similarly, its earliness and comparative drought resistance also make it a satisfactory variety for hay or grain on the Western Plains. It is recommended by the Department for coastal districts, the Northern Tablelands, the North-western Slopes, and for the North-western Plains.

(*To be continued.*)

THE ORIGIN OF NABAWA WHEAT.

IN the brief description of Nabawa wheat given in the January issue of the *Agricultural Gazette* (see page 14) the exact history of the origin of this variety was not made sufficiently clear.

The facts are that a cross between the varieties Gluyas Early and Bunyip was made by Mr. R. J. Hurst in 1908 at Wagga Experiment Farm. Some selections from this cross were made and fixed in New South Wales, but these were eventually discarded as not being sufficiently productive. Meanwhile, Mr. G. L. Sutton (now Director of Agriculture in Western Australia) took some third generation (F 3) seed of this cross with him to that State from Wagga in 1911, and from this material the variety Nabawa was fixed at the Chapman Experiment Farm in 1915.

The New South Wales Department of Agriculture thus laid the foundation (which was carried to such successful fruition by Western Australia) of the variety Nabawa, which bids fair to be one of the most successful wheats ever produced in Australia. There was apparently no design in its selection for the qualities of high resistance to flag smut and moderately high resistance to stem rust, these excellent qualities of the variety being accidentally associated with the selected strain which was finally fixed to Western Australia, and whose resistance to these diseases has since been discovered.

Great credit is due to Western Australia for having evolved an undoubtedly highly productive wheat with such a wide range of adaptability. Its high resistance to flag smut and its comparatively good resistance to stem rust, combined with its productivity, are expected to make it the leading variety in New South Wales within the next few years.

AN ESTIMATION OF THE 1931–32 CITRUS CROP.

IT has been estimated by the State Marketing Bureau that the 1931-32 citrus crop will approximate 2,008,447 bushels of oranges (677,483 bushels of Navels, 846,319 bushels of Valencias, and 484,645 bushels of common oranges and other varieties), 502,123 bushels of mandarins and 424,425 bushels of lemons, making a grand total of 2,934,995 bushels.

Wheat and Oat Trials, 1930.

FURTHER REPORTS OF FARMERS' EXPERIMENT PLOTS.

Western District (Parkes Centre).

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

FARMERS in no less than twenty-one centres co-operated with the Department last season in carrying out trials with wheat and oats.

The Season.

The seasonal conditions, together with the rainfall at various centres in this district, were discussed on page 117 of the February issue of this *Gazette*.

Frost attack was noticeable throughout the area, particularly in the crops sown prior to 15th April, and in those located in depressions. The most favourable sowing period during 1930 in this portion of the State was between the 25th April and the 15th May. Earlier sowings were frost damaged, while later sowings suffered severely from the dry September. Crops that were well in ear by 25th September withstood adverse conditions well and yielded a very satisfactory harvest, while the later-sown areas and crops of the later-maturing varieties suffered particularly from dry weather conditions and rust development. The season undoubtedly favoured the early-maturing types, and this is reflected in the yields in the experiment plots.

Wheat Variety Trials.

The following are the details of the wheat variety trials:—

Condobolin (M. Westcott).—Soil light red loam 15 inches deep, new land. Disc ploughed early June, 1929, springtoothed September, harrowed end December and springtoothed mid-April; sown with a drill on 14th April using 50 lb. seed and 50 lb. superphosphate. The plots were fed off until end of June. The density and growth failed to reach expectations and there is little doubt the feeding off had a retarding effect. Bogan and Waratah showed a fairly marked shedding.

Condobolin (W. J. Gravolin).—Soil light deep loam, new land. Fallowed for wheat in 1929, which failed; combined November and harrowed January, 1930; sown 29th April to 7th May with a combine, using 60 lb. seed per acre and no manure. Germination was patchy owing to moisture shortage; compact portions of seed-bed germinated well. The crop was fed off in June, but this allowed crowfoot to gain the upper hand. Harvest rains caused a loss of from 3 to 6 bushels per acre.

Ootha (A. Heinrich).—Soil red loam, sown to wheat in 1928. Mouldboard ploughed end August, 1929, combined early January and combined and harrowed mid-March; sown 26th April with a combine, using 46 lb.

seed and 55 lb. superphosphate per acre. Rust depreciated the yield of Bogan, Gluyas and Bobin, while Rajah and Waratah were only slightly affected, and Nabawa hardly at all.

Murrumbogie (L. J. Mathews).—Soil red loam 15 inches deep, sown to wheat in 1928. Sundercut July, 1929, combined September, October, January, twice in March and once in April; sown with a combine on 30th April, using 52 lb. seed and 52 lb. superphosphate. Caliph and Nabawa were destroyed by hail just prior to harvest, otherwise would have given high yields.

Murrumbogie (W. Hall).—Soil red loam, carried a wheat crop in 1928. Disc ploughed early August, combined September, October and April, sown with a combine on 5th May, using 60 lb seed and 45 lb. superphosphate. The winter rains were heavier here than in most parts of the western district and the plots did not suffer to any extent during September.

Trundle (K. Gault).—Soil red loam, 9 inches deep, carried wheat in 1928. Sundercut October, 1929, and springtoothed in January, sown 9th to 13th May with a combine, using 50 lb. seed and 45 lb. superphosphate. The dry September and many frosts wilted the plots considerably.

Tottenham (Stanley Bros.).—Soil red loam 7 inches deep, clay loam subsoil; new land, cleared 1928. Fallowed 1928, under wheat in 1929, but crop failed; combined end December, 1929, and sown with a combine on 19th May, using 60 lb. seed and 50 lb. superphosphate. Wilting was very marked. The growing crop received 929 points of rain.

Top Woodlands (J. Martin).— Soil deep red loam, new land. Disc ploughed September, 1929, and also springtoothed in September; sown with a combine on 17th May, using 48 lb. seed and 44 lb. superphosphate. Bobin, Waratah and Nabawa were not harvested until the 10th January owing to rains, while Geeralving, Rajah and Gullen were harvested on 7th November.

Fillafogi (J. Maynard).—A localised flooding from a severe storm in October affected the plots unevenly, and in addition to depreciating the yields rendered comparable results impossible.

Gunning Gap (T. F. Dwyer).—Soil heavy red loam, under wheat in 1928. Mouldboard ploughed early July, 1929, combined October and harrowed in January; sown with a combine on 21st May, using 60 lb. seed and 60 lb. superphosphate. Yields were reduced by wilting, Yandilla King in particular being affected.

Gunning Gap (W. Scott).—Soil heavy red loam, new land. Mouldboard ploughed October, 1929, and springtoothed end December; sown with a combine on 20th May, using 56 lb. seed and 56 lb. superphosphate, the seedbed and subsoil being very dry at sowing time. Haying was very rapid and almost complete during September. The early October rains saved portions of the area, but only very light yields were harvested, and it is wise to disregard the acre yields for comparative purposes; they were—Nabawa 7 bushels 52 lb., Waratah 7 bushels 29 lb., Yandilla King 4 bushels 29 lb., Bena 2 bushels 49 lb.

Nelungaloo (L. Nettlebeck).—The plots were unequally influenced by local flooding during the growing period and also by black oat infestation, and the results are therefore not comparable.

Coradgery (G. Quinn).—Soil red clay loam, fallowed in 1927, under wheat in 1928 and 1929, the last crop failed and was fed off. Sundercut August, 1929, and springtoothed early January, February and March; sown with a combine on 19th May, using 60 lb. seed and 60 lb. superphosphate. The favourable rains of last autumn stood well to the crops during September and there was no wilting. The rainfall during the fallow period was 14 to 15 inches, and for the growing period 12.97 inches.

Tichborne (B. Tomkins).—Soil black clay loam, self mulching, under wheat in 1928. Springtoothed December and March, and sown on 2nd May with a combine, using 58 lb. seed and 50 lb. superphosphate; lightly fed off early in June. The later-maturing wheats were severely affected by the dry spell and did not recover after the early October rains, resulting in low yields. The rainfall on the fallow was 9.54 inches and on the crop 12.05 inches.

Peak Hill (J. Jelbart).—Soil chocolate clay loam, under wheat in 1928. Mouldboard ploughed August, 1929, harrowed October and springtoothed in early January and in February; sown 1st to 15th May with a combine, using 60 lb. seed and 56 lb. superphosphate. Turvey, Federation and Bena wilted to a much greater extent than the earlier sorts.

Alectown (F. A. Patton).—Soil red loam, slightly gravelly to stony, 9 inches deep, under wheat in 1928. Disc ploughed May, 1929, sown to wheat May, 1929, but failed to germinate; combined October and January, and sown 3rd to 5th May with a combine, using 62 lb. seed and 63 lb. superphosphate. Severe wilting occurred in the later varieties, while the more advanced earlier sorts came through the dry time with creditable results. The rainfall during the growing period was 12.96 inches.

Alectown West (A. P. Unger).—Soil chocolate clay loam, under oats in 1928. Mouldboard ploughed July, 1929, harrowed September and October, springtoothed November, harrowed end of December, scarified January, harrowed February, combined and harrowed early March; sown with combine 8th May, using 60 lb. seed and 60 lb. superphosphate. Plots were hardly affected by the dry September. The rainfall for the fallow period was 12.29 inches and for the growing period 14.07 inches.

Parkes (S. J. Plowman).—Soil chocolate clay loam, under wheat in 1926. Disc ploughed September, 1929, springtoothed early January, early February, mid-March and early May; sown with a combine on 15th May, using 56 lb. seed and 60 lb. superphosphate. Slight mildew appeared in Burrill and Bobin during August, and later Exquisite tipped and yielded pinched grain. Geeralying was reduced slightly by shedding.

Forbes (C. McKay).—Soil black clay loam, self mulching, under wheat in 1928. Scarified September, 1929, and harrowed January; sown 19th May, using 65 lb. seed and 50 lb. superphosphate. Wilting was fairly marked. Ford matured the best sample of grain.

YIELDS of Wheat Variety Trials.

	Condobolin (M. Westcott).	Ootha.	Murrumbogie (L. J. Mathews).	Murrumbogie (W. Hall).	Trundle.	Tottenham.	Top Woodlands.	Gunning Gap (T. F. Dwyer).	Coradgery.	Tichborne.	Peak Hill.	Alectown.	Alectown West.	Parkes.	Forbes.	Dorooblagie.	Mowra.	Condobolin (W. J. Gravolin).
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Daroobalgie (Allen Bros.).—Soil, heavy red loam, under wheat in 1928. Mouldboard ploughed August, 1929, combined January and harrowed April; sown with a combine on 16th May, using 58 lb. seed and 50 lb. superphosphate.

Mowra (D. A. Cameron).—Soil red to grey loam, under wheat in 1926. Disc ploughed in early October and combined in March and late April; sown 5th to 6th May with a combine, using 54 lb. seed and 62 lb. superphosphate. Yields were somewhat less than anticipated, mostly due to the appearance of rust. The best grain sample was produced by Gallipoli, followed by Currawa; pinched grain was yielded by Duchess and Exquisite.

Notes on the Wheat Varieties.

The two most promising varieties throughout the experiment plots were Nabawa and Bobin. The former wheat performed very well in the wheat crop competitions, and it was rare indeed throughout the season to hear any adverse comment concerning Nabawa, irrespective of where or under what conditions it was grown.

Upon most farms *Nabawa* proved the most productive variety, and at no time during the trying season did it show distress. Resisting the dry September remarkably well, it remained almost unaffected by the invasion of rust, and with its semi-drooping, well-filled ears, suffered a minimum of damage during the early summer rains, thus yielding to capacity with good quality grain. It has now proved itself under practically all growing conditions.

Bobin is a later introduction to field cultivation than Nabawa, and is hardly beyond the plot stage, but it again demonstrated its bag-filling powers. Although Bobin is subject to flag smut, the infection is about one-third of that found in Waratah. The variety does not mature a bright plump grain, but the grain is of satisfactory appearance. Being of about the same season as Waratah, the most suitable time of sowing Bobin in the west is from 20th April until 10th May.

Riverina behaved very creditably, its yields being consistently near the top wherever tried. Being of the same pedigree as Canberra, it has many of the latter's useful characteristics, and, in addition, is reasonably resistant to flag smut. It is a safe, early-maturing wheat to sow from about the end of April to mid-May.

Ford was very attractive while growing, having clean, tall, fine straw, free of disease (mildew, flag smut and rust), but it really promised rather better than the actual yields. It is, however, worthy of further attention from a disease-resisting point of view, and may be useful on flag smut infected country.

Gullen, which is practically a new wheat and perhaps suitable for the far western localities, gave the surprisingly high yield of 41½ bushels at Murrumbogie, which is midway between Trundle and Condobolin. It also topped the yields at Tottenham with 24 bushels.

Wandi, Kundy and Burrill.—The behaviour of varieties produced by Mr. S. J. Plowman, of Parkes, is of interest. Comparing them with

Waratah with a yield of 33 bushels, Kundy gave 32½ bushels, Burrill 31½ bushels, and Wandi 31 bushels. Wandi and Kundy are very early-maturing, quite a week earlier than Canberra, and are selections from the same cross (Plowman's No. 3 x Canberra). Burrill is more of a mid-season sort with fairly tall, clean straw, and would make splendid hay. Its pedegree is Hard Federation x Warden.

Bogan has been under field trial for several years, and while always yielding well, has not excelled.

Geeralying, a New South Wales crossbred fixed in Western Australia, is of particular interest, as it is the only wheat at present under field trial which is flag smut proof. Its yields also were very satisfactory

The later or mid-season wheats were out of the running altogether, and were affected by both the dry weather and the rust.

Wheat Manurial Trials.

The following are the details of the wheat manurial trials:—

Gunning Gap (M. Broderick).—Soil red loam, previous crop wheat in 1928. Mouldboard ploughed October, 1929, and combined early in January; sown 20th April with a combine, using 54 lb. seed per acre. Nabawa was the variety used. Germination was somewhat uneven. The more heavily manured plots did not show increased wilting during September.

Fillafogi (N. Percival).—Soil deep light loam, previous crop wheat in 1928. Mouldboard ploughed October, 1929, and springtoothed in January and May; sown 15th May with a combine, using 45 lb. seed per acre. The variety used was Federation. Germination was faulty and slow; growth was rather short and was appreciably affected by the dry September.

Tichborne (W. Tyrrell).—Soil light red loam, 9 inches deep, previous crop wheat in 1928. Disc ploughed June, 1929, and harrowed in March; sown with a combine on 10th May, using 65 lb. seed. Bogan was the variety used.

Mowra (E. McCarron).—Soil red loam, previous crop wheat in 1928. Disc ploughed in early January and harrowed mid-March; sown 28th April with combine and harrowed. Seed of Waratah was used at the rate of 65 lb. per acre. Rainfall during the growing period was 16.08 inches; growth was uniform throughout.

YIELDS of Wheat Manurial Trials.

Superphosphate per acre.	Gunning Gap.	Fillafogi.	Tichborne.	Mowra.
lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
40	......	10 34	......	......
50	......	......	34 4	......
60	16 0	12 7	......	29 12
70	......	......	29 54	......
80	15 0	12 39	......	29 44
100	18 0	13 34	31 37	28 16
120	......	......	......	28 18

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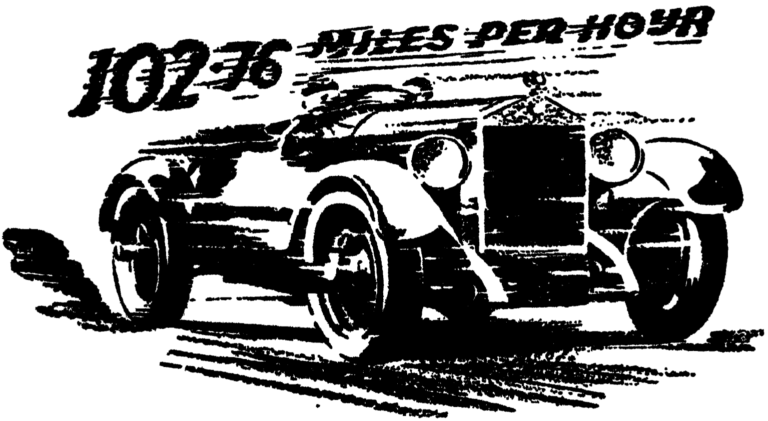

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Comment.

Conditions at four centres where manurial trials were established were such that it is deemed advisable to disregard the results. At Gunningbland (G. Mill), Nelungaloo (J A. Venables), and Murrumbogie (L. J. Matthews) heavy storms resulted in local and uneven flooding of the area, and at Coradgery (L. Ward) the well-prepared fallow proved to be heavily infested with black oats. As to the balance of the trials, the results, particularly in view of past experience, are very indefinite. The heavier applications of manure have not shown to advantage, and such reversal of form may be attributed more particularly to the lack of subsoil moisture aiding the pronounced haying effect of the very dry September.

Wheat Top-dressing Trial.

A rather interesting trial was conducted by Mr. J. Donaldson, of "Burnley," Parkes, in the top-dressing of a fed-off wheat crop with superphosphate. The soil is of chocolate loam with a clay loam subsoil, and the paddock had been cropped for many years, the previous crop being oats in 1929, which was wholly grazed. The land was disced in January, 1930, springtoothed in February, and sown with Marshall's No. 3 wheat on the 26th April with a combine, using 42 lb. seed and 60 lb. superphosphate per acre. The germination was good and the growth was fed off twice up till mid-June. Immediately after the last feeding off a plot was top-dressed with superphosphate at the rate of 150 lb. per acre, and a plot alongside was left untreated.

At heading time the top-dressed plot showed to advantage, being taller, of better colour, and had larger ears. The rainfall during the growing period (April to October) was 14.98 inches, of which 40 points were registered in September.

The trial resulted as follows:—

	Yield.	
	bus.	lb.
Top-dressed plot	28	4
Untreated plot	21	38

An increase of 6 bus. 26 lb. resulted from the treatment under the prevailing seasonal conditions. Past trials in the top-dressing of wheat with superphosphate have generally given negative results, though the conditions of crop growth may not have been similar.

Wheat Rate of Seeding Trial.

Mr. A. Wyatt, of Eagle Farm, Bogan Gate, conducted a rate of seeding trial. The soil was a heavy red loam, previously cropped with wheat in 1928. It was disc ploughed in September, 1929, springtoothed in November and December, and sown on 7th May, 1930, with a combine using seed of Waratah variety and 60 lb. superphosphate per acre. During the dry

September, wilting was more marked in the heavier seeded plots, and the heads were smaller.

RESULTS of Rate of Seeding Trial.

	Yield per acre. bus.	Yield per acre. lb.
Seed 60 lb. per acre	19	17
Seed 70 lb. per acre	16	30
Seed 80 lb. per acre	15	43

Variety Trials with Oats.

The following are the details of the oat variety trials:—

Condobolin (Diggins Bros.).—Soil light red loam, 15 inches deep; new land, fallowed and worked once prior to sowing on 19th May with a combine, using 50 lb. seed and 60 lb. superphosphate.

Ootha (C. W. Buckland).—Soil red loam, under wheat in 1928. Disc ploughed August, 1929, and springtoothed October and end of March; sown on 10th May with a hoe drill, using 45 lb. seed and 40 lb. superphosphate per acre. The loss from shedding was appreciable with Mulga, Myall, and Palestine, yet even so, these varieties gave high yields. Guyra and Belar stood up well to the winds. Belar was most affected by the dry September. All samples were good, the 3-bushel bags weighing from 132 to 150 lb. Rainfall during fallow period was 10.64 inches, and during growing period 11.46 inches.

Murrumbogie (Curr Bros.).—Soil red loam, under wheat in 1929, but the crop failed. Disced March, 1930, and sown 26th to 30th April with a drill, using 40 lb. seed and 45 lb. superphosphate. Growth was excessive, causing extreme lodging and making harvesting impossible.

Albert (J. Clatworthy).—Soil deep red loam, under wheat in 1929, a grazing crop. Scarified November, 1929, harrowed late March, and scarified early May; sown with a combine on 21st May, using 40 lb. seed and 40 lb. superphosphate. Fed off at end of June. Algerian and Belar wilted to a greater extent than Mulga and Gidgee, and the Mulga would probably have matured without October rains.

Fillafogi (H. Bush).—Soil gravelly red loam, under wheat in 1928, oats in 1929 failed. Springtoothed September and December, and sown on 16th May with a drill, using 40 lb. seed and 60 lb. superphosphate. The shedding of Mulga and Gidgee was very marked; Sunrise lodged in several places. Rainfall during the fallow period was 10.89 inches and 13.36 inches during the growing period, of which 444 points were registered in October.

Gunning Gap (W. J. Dwyer).—Soil deep red loam with a clay subsoil, under wheat in 1928. Ploughed June, 1929, harrowed October and springtoothed January; sown with a combine on 7th May, seed 45 lb. and superphosphate 56 lb. being used. Mulga and Palestine lodged more than the other varieties.

Coradgery (G. Tanswell).—Soil gravelly red loam, 6 inches deep, under wheat in 1928. These plots were so damaged by frequent storms as to be unfit for harvesting.

Tichborne (G. Field and Sons).—Soil red loam, under wheat in 1929, which crop failed. Springtoothed early in May, and sown on 2nd May with a combine, using 40 lb. seed and 55 lb. superphosphate. Palestine germinated thinly and its growth was seriously retarded by black oats; it was cut for hay. The shedding and lodging of Mulga was considerable.

Alectown West (A. P. Unger).—Soil chocolate clay loam, under oats in 1928. Mouldboard ploughed July, 1929, harrowed September and October, springtoothed November, harrowed end of December, scarified January, harrowed February, and combined and harrowed early in March; sown with a combine on 8th May, seed 40 lb., superphosphate 60 lb. being used. Germination of Palestine was thin, but its stooling was exceptionally good. The rainfall for the growing period was 14.07 inches, and for the fallow period 12.29 inches.

Goobang (H. Ward).—Soil grey to red loam, under oats in 1928. Mouldboard ploughed in September, 1929, harrowed December, and combined February, March and April; sown with a combine on 20th May, seed 52 lb., superphosphate 60 lb. being used. Palestine gave a thin germination, but stooled well. During early November strong winds and rain caused appreciable lodging in all plots except Guyra: at harvest the false comb gathered most of the grain, but there was a fairly big loss with Algerian.

Daroobalgie (D. L. N. Miller).—Soil chocolate clay loam, under wheat in 1928. Sundercut June, 1929, and harrowed December; sown 9th to 10th May with a combine, using 40 lb. seed and 70 lb. superphosphate per acre. The three later-maturing oats did not withstand the dry spell as well as Mulga, and their later ripening left the tall growth subject to wind and rainstorms, causing much lodging and permitting only partial harvesting Mulga was harvested on 16th November; other plots on 1st December.

Mowra (J. Pearce).—Soil red loam, undulating, new land. Mouldboard ploughed October, 1929, disc cultivated February, and combined March; sown on 14th April with a combine, using 50 lb. seed and 56 lb. superphosphate. The plots were fed off three times—until the end of June. Subsequent growth was very heavy and 60 bushel yields were promised, but wet weather lodged the growths badly.

Manildra (S. Murray).—Soil red loam, undulating and slightly stony, under oats in 1928. Mouldboard ploughed August, 1929, combined January, and disc cultivated late February; sown on 6th May with a combine; using 40 lb. seed and 76 lb. superphosphate. Mulga lost much from shedding. Guyra and Belar suffered a reduction in yield from lodging, while Algerian wilted in patches in September. Grain samples were good.

Nelungaloo (A. Scrivener).—Soil red loam 12 inches deep, previous crop oats in 1929, wholly grazed. Scarified early January, harrowed January, and combined early June; sown 8th June with a combine, using 40 lb. seed and 60 lb. superphosphate per acre. Mulga was harvested a week earlier than the other varieties, and escaped some of storm damage. The later varieties lodged rather considerably.

Forbes (H. Green).—Soil chocolate clay loam, previous crop wheat in 1928. Disc ploughed June, 1929, worked four times, and sown on 15th April, using 60 lb. seed and 70 lb. superphosphate per acre.

YIELDS of Oat Variety Trials.

Variety.	Condobolin.	Ootha.	Albert.	Fillafogi.	Gunning Gap.	Tichborne.	Alectown West.	Goobang.	Daroobalgie.	Mowra.	Manildra.	Nelungaloo.	Forbes.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Mulga	19 87	49 3	44 0	24 6	28 0	22 0	54 9	45 0	50 23	32 25	43 80	45 86	81 11
Belar	19 24	30 12	36 0	33 39	24 0	24 0	41 28	48 0	21 7	35 7	43 22	23 32	27 28
Guyra	17 5	43 14	46 0	...	23 8	...	51 0	46 20	28 9	27 15	48 12	38 38	33 10
Palestine ...	20 4	47 26	...	...	36 0	..	52 5	44 0	...	...	...	...	...
Myall	...	45 0	...	...	...	...	...	...	...	...	...	...	...
Gidgee ...	...	...	33 0	23 32	...	...	...	...	...	...	..	...	...
Algerian ...	...	...	36 0	...	..	...	33 13	38 0	22 19	40 9	39 6	26 36	...
Sunrise ...	...	...	...	38 0	27 9	...	..	...	...	...	...	...	...
Lachlan ...	...	...	...	...	...	24 0	...	...	...	...	...	...	...

Notes on Oat Varieties.

Throughout the trials the variety Mulga generally gave the most satisfactory result. Other varieties in many instances gave exceptional promise, but owing to their later maturity were subject to more storm damage than Mulga, resulting in considerable lodging and shedding.

Palestine has given satisfactory grain yields, but it is lacking in bulky early growth for winter grazing and its value is therefore discounted. The varieties Myall, Gidgee and Sunrise would be grown for the same reason as Mulga, but the latter excels them in results.

Central-western District.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

Variety, manurial and rate of seeding trials with wheat, and variety and manurial trials with oats, were conducted on farmers' experiment plots in 1930.

The Season.

Judging by the ultimate yields, the season must be regarded as a very satisfactory one throughout the central-west. It was, however, an extremely erratic one, yields at one time promising to be exceptional, only to be followed by a period when a comparative crop failure was a matter of days, and later by a return to high prospective yields which were eventually considerably reduced by disease, wind damage, and grain bleaching.

Rainfall registrations at representative centres are given in the accompanying table.

Rainfall Records.

Month.	Canowindra.			Eugowra.			Grenfell.			Greenethorpe.			Cowra.			Molong.		Cudal.
	H. Traves & Bros.	S. E. Nash.	L. M. Bassingthwaighte.	F. Mulligan.	W. J. Bradford	A. Pengelly.	W. F. Griffin.	O. G. Blayney	Barr Bros.	N. Freebairn.	A. McKay.	G. Davidson.	C. Pengelly.	I. L. Corke	W. A. O'Neil.	G. E. Bradley and Son.	G. L. McLaren	D. O'Neil.
1929.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
July	20	25	21	19	18	18	21	18	23	10	21	26	18	11	14	18	40	27
August ...	169	196	196	192	191	185	171	144	164	199	177	230	189	204	85	127	166	173
September ...	77	105	72	86	93	89	75	...	55	68	71	83	100	85	83	90	117	142
October ...	100	133	107	65	66	61	30	51	42	43	39	45	92	69	111	85	111	92
November ...	140	140	156	166	145	141	290	211	306	285	329	325	379	289	389	111	237	192
December ...	290	279	329	227	270	261	229	207	254	257	257	218	384	371	310	135	266	294
1930.																		
January ...	41	60	119	77	84	64	20	...	...	40	50	20	24	48	38	125	276	130
February ...	...	75	135	17	66	31	43	44	42	12	31	26	12	...	20	37	130	83
March ...	125	292	52	...	40	...	...	32	40	84	49	109	13	37	81	130	143	125
Total on fallow ...	9·62	13·05	11·87	8·49	9·73	9·50	8·79	7·07	9·26	9·78	10·24	10·82	12·11	11·14	11·31	8·58	14·86	12·58
1930.																		
April ...	...	80	130	83	81	90	147	124	118	139	131	127	155	117	125	95	91	78
May	135	166	183	121	116	106	79	163	83	87	78	125	107	126	109	107	168	151
June ...	226	190	229	275	280	281	147	163	170	187	154	196	155	160	163	180	257	169
July	229	225	243	212	243	159	197	196	215	181	167	190	173	237	183	174	310	242
August ...	229	245	255	169	157	40	178	169	170	172	182	202	170	219	149	226	311	269
September ...	76	55	79	34	27	...	94	85	100	110	141	113	85	45	54	22	47	37
October ...	476	396	435	377	279	181	394	420	407	407	374	441	416	444	345	416	490	451
November ...	158	134	166	188	147	127	108	114	105	153	136	162	178	188	180	104	137	174
Total on crop ...	15·29	14·91	17·20	14·59	13·30	9·84	13·44	14·34	13·68	14·36	13·63	15·56	14·39	15·36	13·08	13·24	18·11	15·71

The Wheat Variety Trials.

Canowindra (L. M. Bassingthwaighte).—Soil light red loam, undulating; oats 1927 and 1928, fed off. Disc ploughed 6 inches August, 1929, and harrowed, springtoothed end October, harrowed December, springtoothed end January, harrowed end February and first week April; sown with combine 24th May, seed 70 lb., superphosphate 75 lb. per acre.

Toogong (H. J. Balcombe).—Soil light red loam; previous crop oats for hay. Disc ploughed August, harrowed January, springtoothed twice in May; combine sown and harrowed 12th and 16th May, seed 70 lb., superphosphate 65 lb. per acre. The mid-November winds caused premature ripening, and a big percentage of the heads (of Duchess in particular) broke off before harvest.

Pinecliffe (G. E. Bradley and Son).—Soil medium to strong red loam; old land. Mouldboard ploughed August, springtoothed November, February, and April; sown with a combine, the late wheats on 7th May and the early varieties 19th May with 70 lb. seed and 70 lb. superphosphate per acre.

Eulimore (W. J. Bradford).—Soil light red sandy loam; fifth crop, previous crop wheat. Disc ploughed 4 inches August, springtoothed November, January, and March; combine sown on 23rd May; seed 60 lb., superphosphate 62 lb. per acre.

Carcoar (W. Burns).—Soil light red to grey loam; old cultivation, originally box and red gum country: grazing 1929. Mouldboard ploughed February, harrowed end March and April; combine sown 5th May. These plots were badly affected with disease.

Kikiamah (J. Carter).—Soil medium red loam; old cultivation. Mouldboard ploughed end July, harrowed first week August, springtoothed January, and prior to hoe drill sowing 17th May with 62 lb. seed and 65 lb. superphosphate per acre.

Wynnefield (F. L. B. Corke).—Soil medium red loam; old cultivation, originally box country. Mouldboard ploughed May, 1929, sown with oats and fed off; springtoothed November and January, disc cultivated first week February, rolled and springtoothed first week May, harrowed 13th May, springtoothed prior to drilling, and harrowed after; sown 9th June with 60 lb. seed and 90 lb. superphosphate per acre.

Greenethorpe (A. N. Freebairn).—Soil light red loam, undulating, originally box country, old cultivation; previous crop oats 1929 and fed off. Sundercut November, springtoothed January, harrowed May, springtoothed in front of drill 6th May, seed 60 lb., superphosphate 80 lb. per acre.

Billimari (G. A. Gray).—These plots were attacked by the wheat root grub, and the yields cannot be regarded as comparable.

Mogongong (W. F. Griffin).—Soil grey loam; old cultivation. Disc cultivated August and again first week April; combine sown 17th May, seed 60 lb., superphosphate 80 lb. per acre. Flag smut was responsible for loss in yields in all varieties except Geeralying and Nabawa.

Billimari (F. W. Harding).—Soil medium light red loam, undulating. Mouldboard ploughed end August, harrowed October, springtoothed January and February, harrowed end March, springtoothed prior to drill sowing 8th and 9th May with 1 bushel seed and 74 lb. superphosphate per acre.

Tyagong (Maroney Bros.).—Soil strong red loam; previous crop wheat 1927. Sundercut August, 1929, rigid-tined February, 1930, and early May; drill sown 7th May, 60 lb. seed and 70 lb. superphosphate per acre.

Cranbury (A. S. McDonald).—Soil medium red loam, originally box country. Disc ploughed 5 inches October, harrowed twice November and in December, springtoothed January, harrowed February, springtoothed prior to drill sowing 30th May with 70 lb. seed, 65 lb. superphosphate per acre.

Nora Creek (G. L. McLaren).—Soil light sandy loam, undulating; oats 1929, fed off. Mouldboard ploughed early January, springtoothed March, and harrowed again in April, springtoothed prior to combine sowing on 10th June with 60 lb. seed and 73 lb. superphosphate per acre.

Greenethorpe (A. J. Mackay).—Soil level medium red loam; old cultivation; oats 1929, fed off. Disced mid-November, springtoothed January and April; combine sown 15th May, 60 lb. seed and 95 lb. superphosphate per acre.

Millthorpe (J. Moad).—These plots lodged and tangled very badly, and comparable results were not obtainable.

Eugowra (F. Mulligan).—Soil level light red loam; under cultivation twenty years, originally box country. Disced first week August, springtoothed November and end December; combine sown 2nd May with 60 lb. seed and 80 lb. superphosphate per acre.

Quandong (H. Nealon).—Soil light red loam; old cultivation. Mouldboard ploughed and harrowed November, springtoothed March and in front of the drill when sowing on 16th May with 56 lb. seed and 75 lb. superphosphate.

Bowan Park (D. O'Neill).—Soil strong red loam; new ground, originally box country. Mouldboard ploughed 1928 but not sown; reploughed November, 1929, harrowed in February and end April; combine sown 22nd May, seed 60 lb., superphosphate 70 lb. per acre.

Bogalong (J. H. Parker).—Soil light red loam; old cultivation. Mouldboard ploughed September, rigid-tined January, again April, and harrowed, rigid-tined May, and combine sown and harrowed 16th May, seed 60 lb., superphosphate 75 lb. per acre.

Eugowra (A. Pengelly).—Soil level light red sandy loam; old cultivation; oats 1929, grazed till October. Springtoothed January, disc cultivated February, springtoothed March, and combine sown and harrowed 9th May, seed 60 lb., superphosphate 75 lb. per acre. The crop was fed off in June.

Wattamondara (C. Pengelly).—Soil dark red silt, clay subsoil at 8 to 12 inches. Mouldboard ploughed early August, springtoothed September and January, disc cultivated March, combine sown and harrowed 1st May, seed 58 lb., superphosphate 70 lb. per acre. Fed off in June.

YIELDS of Wheat Variety Grain Trials.

Varieties.	Canowindra, L. M. Bassingthwaighte.	Toogong, H. J. Balcombe.	Pinecliffe, G. E. Bradley and Son.	Bullmore, W. J. Bradford.	Grenfell, Jas. Carter.	Wynnefield, F. L. Corke.	Greenethorpe, A. N. Freebairn.	Mogongong, W. F. Griffin.	Billimari, F. W. Harding.	Tyagong, Marouey Bros.	Cranbury, A. S. McDonald.	Nora Creek, G. L. McLaren.	Greenethorpe, A. J. McKay.	Eugowra, F. Mulligan.	Quandong, H. Nealon.	Bowan Park, D. O'Neill.	Bogalong, J. H. Parker.	Eugowra, A. Pongelly.	Wattamondara, C. Pengelly.	Tyagong, Powderley Bros.	Canowindra, H. A. Traves and Bros.	Wattamondara, Walker Bros.
Early Varieties. (Standard for Comparison—Waratah.)																						
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.
Aussie	...	...	...	28 50	25 17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bald Early	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	22 6
Baroota Wonder ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	25 3	...	...	...
Bobin	27 22	...	37 36	...	27 18	27 56	...	33 46	...	...	33 6	13 0	31 14	...	39 25	25 7	...	...	...	30 34	...	33 2
Burrill	...	...	...	22 0	...	...	...	29 30	...	...	...	...	...	27 42	...	...	...	...	...	...	...	...
Canberra	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	30 46	...	...	...	...	...	...
Duri	36 50	...	...	31 58	...	28 36	...	...	...	...	38 0	...	23 42	...	...	...	32 52	...	...	31 21	...	29 51
Geeralying	...	...	...	26 4	23 8	27 36	...	30 46	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gluyas Early	...	...	...	...	21 22	24 38	...	...	...	...	26 54	...	...	...	...	...	...	...	...	...	...	...
Nabawa	34 20	...	37 14	...	23 40	26 16	22 21	33 49	...	...	36 10	21 42	28 26	33 46	39 28	33 0	28 18	.	...	30 43	...	...
Rajah	33 8	...	33 34	26 24	25 6	23*39	...	30 28	...	...	30 0	18 43	28 48	. .	...	...	30 7	...	...	29 47	...	26 7
Ranee	33 36	...	...	...	...	...	...	...	...	...	...	...	...	. .	...	...	...	...	...	...	...	...
Riverina	...	...	...	...	...	...	...	...	...	...	37 16	...	...	.	...	...	...	...	...	...	...	...
Waratah	28 10	...	35 39	29 57	25 0	22*56	...	30 53	...	...	36 11	22 12	29 13	26 15	...	32 6	28 18	...	...	27 24	...	31 25
Midseason Varieties. (Standard for Comparison—Bena.)																						
Bena	...	...	...	...	...	...	23 42	...	...	...	27 50	..	...	23 13	33 20	...	...	...	...	...	...	25 9
Bredbo	...	...	...	...	...	...	...	...	...	...	...	...	...	23 26	...	...	...	...	...	...	...	25 6
Duchess	...	20 0	...	...	...	...	...	29 57	...	...	...	...	28 40	...	...	...	...	16 28	...	...	...	...
Federation	...	...	...	...	...	...	...	...	...	...	...	11 18	...	...	29 35	...	23 2	...	...	24 26	...	...
Ford	...	...	...	...	...	...	...	...	30 46	33 34	...	...	31 3	30 23	33 23	...	...	...	30 6	...	...	27 22
Free Gallipoli	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	27 27	...	...	...	...	...
Longerenong Federation..	...	...	...	...	...	...	...	...	...	...	...	11 15	. .	...	29 20	...	23 24	...	...	24 53	...	...
Nizam	...	...	...	...	...	...	...	25 40	...	...	...	...	...	. .	...	...	...	...	...	...	...	...
Union	...	...	...	...	...	...	...	...	...	...	...	...	...	. .	...	...	...	...	...	...	...	...
Late Varieties. (Standard for Comparison—Yandilla King.)																						
Cadia	...	21 20	...	...	...	...	...	...	25 3	32 28	...	...	...	...	...	...	...	...	23 19	...	...	...
Canimbla	...	23 3	32 41	...	...	...	17 48	...	26 20	...	...	...	...	...	...	27 25	...	18 29	25 18	...	27 28	...
Carinda	...	...	...	...	...	...	...	...	...	36 28	...	...	...	...	...	...	...	...	...	...	19 12	...
Dundee	...	...	...	...	...	...	...	...	...	...	...	...	...	33 55	38 9	...	...	...	...	...	...	...
Exquisite	...	20 45	...	...	...	...	...	...	...	28 32	...	...	...	...	31 36	...	...	...	...	...	18 22	...
Marshall's No. 3 ...	...	...	34 13	...	...	...	19 0	...	...	...	...	...	..	...	...	...	...	12 0	...	...	...	...
Penny	...	22 36	33 20	...	...	...	21 41	...	25 0	38 21	...	...	...	25 36	35 44	20 0	...	14 55	21 57	...	21 27	...
Turvey	...	22 55	29 40	...	...	...	...	...	...	...	...	...	...	...	...	20 36	...	12 10	...	...	20 47	...
Wandilla	...	...	...	...	...	...	...	...	21 42	34 22	...	...	...	...	...	...	...	...	...	...	28 54	...
Yandilla King	...	24 9	...	...	...	...	20 21	...	22 5	36 21	...	...	...	...	31 30	27 41	...	12 40	23 48	...	20 9	...

* Yields not comparable owing to attack by Wheat Root Grub (*Anodontonyx tetricus*).

Tyagong (Powderley Bros.).—Soil medium red loam; not cropped for four years. Disc ploughed early April, rigid-tined May, drill sown 24th May, seed 60 lb., superphosphate 60 lb. per acre.

Canowindra (H. A. Traves and Bros.).—Soil medium to strong red loam; old cultivation. Mouldboard ploughed October, harrowed November, springtoothed January and harrowed, combine sown 15th May with 60 lb. seed and 70 lb. superphosphate, and harrowed just prior to germination.

Wattamondara (Walker Bros.).—Soil medium loam; cleared 1926, oats 1928, fed off. Disced first week October, harrowed November, springtoothed and harrowed end December, harrowed May, combine sown 16th May. Fed off in July.

Notes on Wheat Varieties.

The chief factor affecting the yield of wheat varieties this season was stem rust, and the success of particular varieties is largely a measure of their rust escaping or resisting qualities; other factors were their lodging tendency and loss of weight due to bleaching.

In the early-maturing varieties, the outstanding variety has been *Duri,* which at three centres where it was tried in comparison with Waratah, Nabawa, Bobin, and Rajah, gave the highest yield. It was under trial at eight centres, and secured first place at six and third and fifth at the other two. This was not altogether unexpected, as Duri has always been a consistently good yielder and a rival to Nabawa and Waratah. The straw is very good and carries very little flag, the grain fills well under all conditions, and does not bleach badly. Although susceptible to flag smut, it escapes rust. It should be much more widely grown as a late sowing variety.

Probably the next best bag filler this season was *Bobin,* which was tested at twelve centres, and was first at four, second at two, third at one, fourth at two, and fifth and sixth at one. Except at two localities where rust was not bad the quality of the grain was poor, containing a big proportion of thin, badly-pinched grain. Where rain fell on it during harvest the grain was also discoloured, although not badly bleached. There is no doubt that this variety has the highest yielding propensities of any in this class, but unfortunately the quality of the grain is too readily influenced by disease and adverse weather conditions. Where rust was bad—for example, at Nora Creek—it was unsaleable for milling purposes.

Nabawa was very successful in these experiments and throughout the district this season. It was tried at twelve centres, and secured first place at two, second place at four, third at two, fourth at three, and fifth at one. Its success was largely due to its rust-resistance, which, combined with its resistance to flag smut, makes it extremely valuable. It was outstanding also for its quality of grain, even after being subjected to heavy rains during harvest. Its chief defect was a tendency to lodging where the growth was very heavy, and to breaking of the straw just above the ground when subjected to heavy winds.

Waratah was also very satisfactory, and compared with its most serious rival, Nabawa, gave equally as good results. At the thirteen localities where it was sown in comparison with other early varieties it was first at two, second at three, third at three, fourth at three, and fifth at two. Actually, at twelve centres where it was tried with Nabawa, it tied at one and gave the higher yield at six. The grain was more affected by rust than that of Nabawa, but it did not bleach badly with harvest rains. Although Waratah is in a measure being displaced by Nabawa, it is still one of the most consistent varieties for the central-west, and should not be discarded without good reason.

Rajah also gave a very satisfactory return, and although it did not give the highest yield at any of the eleven centres where it was tried it was second at two, third at two, fourth at five, and fifth and six at one. Although susceptible to rust, the grain does not pinch nearly as badly as Bobin. Its chief defect this season was that it bleached badly with rain at harvest time. As the grain normally does not weigh very well this is important. It is not likely to outclass either Waratah or Nabawa, and should not be sown in preference to Duri.

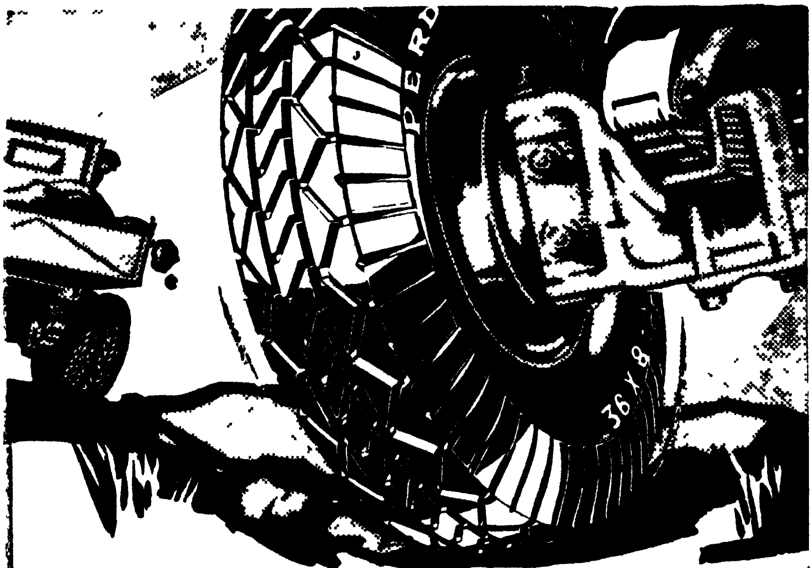
Geeralying was tried for the first time, and gave very good results, although it did not yield up to appearances and was outyielded by other varieties. Owing to its apparent immunity to flag smut, tall growth, and early maturity, it should be very valuable for sowing on headlands.

Of the other early-maturing wheats under trial, *Aussie* and *Riverina* gave very good returns, but *Burrill* did not show to advantage, and *Gluyas Early* is much too weak in the straw.

In the mid-season class, *Ford* was by far the most outstanding, outyielding all other varieties in this section wherever tried, and where sown in comparison with mid-season and late varieties at three centres, gave the highest yield at two. It is resistant to rust and flag smut, matures an excellent grain which bleaches only slightly with wet weather after maturing, and invariably yields well. Although rather tall growing, it did not lodge badly this season. It deserves to become very popular in the central-west for mid-season sowing.

Federation and all varieties of Federation parentage were badly rusted, *Bena* in particular.

The season did not favour long maturing varieties, and rust, wind damage and foot-rot, reduced the yields considerably. Among the older varieties *Canimbla, Penny,* and *Yandilla King* were the most satisfactory, but Canimbla matured by far the best sample of grain, being less affected by rust. Of the new varieties, *Dundee* and *Carinda* show promise. The former yielded over 38 bushels at Quandong, and was the best of eight late and mid-season varieties, and with a yield of 34 bushels was the best of five varieties of the same season at Eugowra. It is fairly short in the straw and has a very attractive head. The grain was well filled. Rust was not



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bad at either centre where it was tried. Carinda is very tall growing and rather tough to thresh. It was as good as Yandilla King at the two centres tried and is worthy of further test.

Exquisite was again disappointing; it matured a long, hollow grain, considerably below f.a.q. due to rust and lodging. It evidently requires ideal conditions and has only one redeeming feature, viz., resistance to flag smut.

Details of Wheat Manurial Trials.

Greenethorpe (G. Davidson).—Soil medium red loam, undulating; old cultivation. Mouldboard ploughed August, disc cultivated January, harrowed March, springtoothed first week May; combine sown and harrowed 19th May, seed 65 lb.; variety Waratah; fed off to end July.

Quandong (J. T. Hawick).—Soil light red loam; third crop; wheat 1929. Disc ploughed August, springtoothed end April, and twice prior to sowing with a hoe drill and harrowing on 6th May; seed 60 lb.; variety Canimbla.

Lockwood (S. E. Nash).—Soil medium red loam; old cultivation. Mouldboard ploughed October, springtoothed end December, again mid-March; combine sown and harrowed 15th May, seed 65 lb.; variety Bobin.

Iandra (L. E. Smith).—The yields of these plots were affected by strong, cold winds in November and consequent "haying in"; the yields were not comparable.

YIELDS of Superphosphate Manurial Trials with Wheat.

Superphosphate per acre.	Lockwood (S. E. Nash). Variety, Bobin.	Grenfell (J. T. Hawick) Variety, Canimbla.	Greenthorpe (G. Davidson). Variety, Waratah.
lb.	bus. lb.	bus. lb.	bus. lb.
56	40 35	27 34	....
70	42 19	26 1	....
84	43 52	31 14	26 25
112	....	....	24 55
140	....	....	25 45

Comment.—These yields are consistently in favour of 84 lb. per acre. At Lockwood the result was the same as in previous years, but at Greenethorpe and Grenfell the positions of last season were reversed.

Wheat Seeding Trials.

Tyagong (Barr Bros.).—Soil light red sandy loam; old cultivation. Mouldboard ploughed November, harrowed January and May; combine sown and harrowed 22nd May; variety Nabawa: superphosphate 87 lb. per acre.

Lockwood (S. E. Nash).—Cultural details as in wheat manurial trial; sown 15th May; variety Nabawa; superphosphate 50 lb. per acre.

Grenfell (O. G. Blayney).—Soil level, uniform, light red loam; third crop, all wheat. Disc ploughed August, harrowed early November, scarified end December; combine sown and harrowed 17th May; superphosphate 70 lb. per acre.

YIELDS of Wheat Seeding Experiments.

Seed per acre.	Tyagong (Barr Bros). Variety, Nabawa	Lockwood (S. E. Nash). Variety, Nabawa.	Grenfell (O. G. Blayney). Variety, Aussie.
lb.	bus. lb.	bus. lb.	bus. lb.
51	....	....	29 27
57	22 46	....	31 31
60	....	41 57	....
64	....	....	31 46
66	22 40	....	....
71	....	....	31 44
74	22 00	... .	....
77	.... . .	41 48	....

Comment.—Two of the trials were conducted with Nabawa because of its rather poor stooling qualities. The results are somewhat surprising, as practically no difference in yield was obtained. This was the case also with Aussie except that the very light seeding was decidedly inferior.

Wheat Hay Trials.

A hay trial of wheat varieties was conducted by Mr. W. Burns, "Goongirwarrie," Carcoar. The cultivation details are given in connection with grain variety trials. The yields were as follows:—

Variety.	*Yield.* t.	cwt.	qrs.
Yandilla King	2	12	3
Exquisite	2	11	0
Cadia	2	10	2
Turvey	2	8	2
Cleveland...	2	6	3

These yields were affected by take-all, foot rot, and strong winds in mid-November.

Diseases in Wheat.

The disease that did most damage in wheat crops was stem rust. The later districts suffered most, a considerable proportion of pinched grain being harvested. The variety which showed the most resistance to the disease was undoubtedly Nabawa, while among the newer varieties Ford was outstanding in this respect. Waratah also was very satisfactory in most cases, chiefly owing to its ability to mature a reasonably full grain although the stem appears to be badly rusted. This applies also, though to a lesser degree, to Rajah. On the other hand varieties with apparently the same degree of attack such as Bobin, Federation, Bena, &c., pinch so badly that the grain is practically unsaleable. Among the late maturing varieties, Canimbla gave by far the best results where rust was prevalent, exhibiting quite a measure of resistance.

Flag smut reduced the yield appreciably on individual farms in some localities, but generally speaking the attack was considerably lighter than for some years. Although quite a degree of infection was noticed in several crops of Nabawa, particularly in the Cowra district, this variety is still the most resistant of the popular varieties. The comparative resistance of Ford, Wandilla, and Riverina was again noticed.

The leaf spot fungus (*Septoria tritici*) was considerably more widespread this season than ever before, and in some localities caused the young shoots to die and a definite thinning out of the crop. There appears to be a variation in the susceptibility of varieties to this disease, and the variety most resistant to the major diseases, such as flag smut and rust, viz., Nabawa, appeared to suffer most this season from the leaf spot fungus. Other varieties in which the disease was most noticeable were Penny, Cadia, Bobin, Yandilla King, and Turvey; the most free were Ford and Exquisite.

Foot-rot, particularly in Yandilla King, Turvey, and Penny was most prevalent in the later districts and considerably reduced the yields. Much of the damage, however, attributed to this disease, was premature ripening due to the unseasonable strong winds in mid-November.

Oat Variety Trials.

Grenfell (O. G. Blayney).—Cultural details as in wheat seeding trial. Sown 17th May; seed 53 lb., superphosphate 70 lb. per acre.

Cowra (C. Bennett).—Soil light red loam. Disced in February, rigid tined May; combine sown 28th May; seed 40 lb., superphosphate 75 lb. per acre.

Greenethorpe (J. R. Dawe).—Soil light red loam; old cultivation. Mouldboard ploughed August, harrowed November, rigid-tined February, springtoothed May; combine sown 22nd May; seed 50 lb., superphosphate 70 lb. per acre.

Mogongong (W. F. Griffin).—Cultural details as in wheat variety trial. Sown 17th May; seed 45 lb., superphosphate 70 lb. per acre.

Tyagong (Joyce Bros.).—Soil light red loam; wheat, 1929. Sundercut early April, rigid-tined and harrowed in front of drill on 17th May; seed 1½ bushels, superphosphate 70 lb. per acre.

Cranbury (Loomes Bros.).—Soil light red loam; old cultivation wheat, 1929. Disced January, springtoothed February and March, disc cultivated early April; drill sown 26th April and harrowed; seed 45 lb., superphosphate 68 lb. per acre.

Tyagong (Maroney Bros.).—Soil medium to strong red loam; undulating; grazing since 1917. Disced October, rigid-tined mid-February, harrowed March: hoe drill sown 10th April; seed 50 lb., superphosphate 50 lb. per acre. Fed off bare in July.

Eugowra (F. Mulligan).—Cultural details as in wheat variety trials. Sown 3rd May; seed 50 lb., superphosphate 80 lb. per acre.

Quandong (H. Nealon).—Cultural details as in wheat variety trials. Sown 17th May; seed 50 lb., superphosphate 75 lb. per acre.

Cowra (W. A. O'Neill).—Soil light red loam; grazing since 1925. Mouldboard ploughed end April, 1930, rigid-tined and harrowed in front of drill; sown 8th and 9th May; seed approximately 53 lb. (Gidgee 56 lb. and Palestine 40 lb.) and superphosphate 65 lb. per acre.

Bowan Park (D. O'Neill).—Owing to the strong new ground the growth was too heavy, and the blocks lodged so badly that it was impossible to harvest them satisfactorily.

Eugowra (A. Pengelly).—Cultural details as in wheat variety trials. Sown 10th May; seed 40 lb., superphosphate 75 lb. per acre.

Canowindra (H. A. Traves and Bros.).—Cultural details as in wheat variety trials. Sown 9th May; seed 50 lb., superphosphate 70 lb. per acre.

YIELDS of Oat Variety Trials.

Variety.	Grenfell, O. G. Blayney.	Cowra, C. Bennett.	Greenethorpe, J. R. Dawe.	Mogongong, W. F. Griffin.	Tyagong, Joyce Bros.	Cranbury, Loomes Bros.	Tyagong, Maroney Bros.	Eugowra, F. Mulligan.	Quandong, H. Nealon.	Cowra, W. A. O'Neill.	Eugowra, A. Pengelly.	Canowindra, H. A. Traves & Bros.
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.
Algerian ...	...	...	...	...	60 0	44 20	...	...	...	18 29	29 36	31 16
Belar	31 17	...	45 10	38 37	68 0	36 0	64 22	43 30	56 16	25 17	24 10	43 13
Buddah ...	30 17	...	35 29	...	63 10	...	47 28	...	...	21 19	...	...
Gidgee ...	...	43 37	...	...	...	23 2	...	17 12	49 3	22 20	...	...
Guyra ...	...	...	...	...	51 30	...	...	...	...	...	...	42 0
Lachlan ...	...	...	42 18	...	68 0	33 0	...	...	...	17 16	25 12	39 3
Mulga ...	41 14	48 8	33 26	24 30	65 20	...	54 22	24 32	50 23	18 23	...	...
Myall	35 3	...	..	30 4	80 0	...	58 22	...	...	...	...	...
Palestine ..	38 25	49 21	37 14	...	73 20	*17 28	48 34	28 8	37 7	...	26 5	...

* Yield not comparable owing to attack by wheat root grub.

Notes on Oat Varieties.

The season, almost up to harvest time, was ideal for oats, and exceptionally dense and luxuriant crops were in evidence. In places they were rather too growthy and considerable loss occurred through lodging, but the winds in the middle and end of November, and rain in December, caused the grain to shatter and the heads to break off. The yields of oats in these trials are therefore chiefly a measure of their ability to stand up to these conditions.

It is interesting to note the consistent excellence of Belar, which under trial at eleven centres gave the highest yield at eight, and an average return of 43 bushels 15 lb. per acre. It held the grain well, did not break off or lodge badly, and invariably was a dense and even crop. The grain was well filled, bright and heavy weighing.

Myall and Mulga yielded well when harvested early, but broke off badly where the harvesting was delayed by unfavourable weather.

Lachlan also was very satisfactory. It is of the same season as Belar, is not so hardy and seldom yields as well. The straw is much coarser and the grain less attractive.

Palestine plots germinated badly and the yields in most cases were not comparable. However, where conditions were uniform, it was not impressive, and although very short, lodged and broke down badly.

Gidgee matured an excellent sample of grain, but if not harvested as soon as mature, shatters too readily.

While the demand for an oat in the chief grain growing section of the district is for an early maturing one (such as Mulga) mainly, so that the oats harvest is finished before the wheat is ready, the value of Belar as a mid-season variety—it has shown under practically all conditions its ability to give excellent grain yields or to make a hay of unsurpassed quality—should be more fully recognised.

Diseases.—Oats were particularly free of all diseases this season. Generally when the weather favours the development of rust, oats are the first to be attacked, and in view of the widespread attack on wheat it is remarkable that all varieties of oats should have been quite free.

Oat Manurial Trial.

Eulimore (W. J. Bradford).—Cultural details as in wheat variety trial. Sown 23rd May; seed 50 lb. per acre; variety Lachlan. Plots were sown with M17 at 90 lb. per acre, and superphosphate at 60 lb. per acre. The yields were:—

	bus.	lb.
M17 (two parts superphosphate and one part sulphate of ammonia), 90 lb. per acre	24	20
Superphosphate, 60 lb. per acre	30	23

North-western District.

J. A. O'REILLY, H.D.A., Agricultural Instructor.

Variety, rate of seeding, fertiliser, time of sowing, and cultivation experiments with wheat, and variety and grazing trials with oats were carried out on farmers' experiment plots last season.

The Season.

A description of the general seasonal conditions in this part of the State, together with a table of rainfall at various centres was given on page 128 in the February issue.

Details of the Wheat Variety Trials.

Bingara (G. L. Howson).—Soil, medium red loam; wheat last season; disc ploughed January, 1930, springtoothed April; sown with springtooth cultivator on 2nd May, seed 45 lb. per acre, no fertiliser. Ford's resistance to rust was largely responsible for its success over Bena and Nabawa.

Curlewis (W. O. Manning).—Soil, medium red to light loam; disc ploughed December, 1929, springtoothed February; sown with combine 19th April; seed 40 lb. per acre, superphosphate 30 lb. per acre.

Emerald Hill (F. Shaw).—This area carried a light crop in 1928; disc ploughed January, 1930, springtoothed April; sown with a combine on 21st May, seed 43 lb. per acre, without fertiliser. A feature of this trial was that Ford grain weighed up to 200 lb. per bag.

Kelvin (J. Barwick).—Soil, a gritty to medium-textured greyish loam; springtoothed January, 1930, and again in February and March: sown with a combine, seed 45 lb. per acre, without fertiliser. Although it was not general in the trials, Bobin matured a plump sample of grain.

Mary's Mount (F. Foster).—Soil, a greyish to chocolate loam; wheat last season; harrowed prior to springtoothing in January, 1930, springtoothed again in March and sown with rigid tine combine on 25th April, seed 50 lb. per acre, without fertiliser. Rust was prevalent in these plots.

Boggabri (D. M. Leys).—Soil, a sandy loam; wheat last season; disc ploughed February, 1930, and springtoothed April; sown on 1st May, seed 45 lb. per acre, without fertiliser. Although outyielding Waratah in this particular case, Rajah has not yielded as consistently.

Gunnedah (L. G. Pryor).—Soil, a chocolate loam; disc ploughed January, 1930; sown with a combine and harrowed; seed 50 lb. per acre: two sowings were made, one of midseason varieties on 24th April, and the other of early varieties on 3rd May.

Delungra (A. M. Paterson).—Soil, a black basaltic loam: wheat last season; springtoothed middle of April, 1930, harrowed April; sown with a combine 14th May, seed 45 lb. per acre, without fertiliser. Despite the fact that rust was prevalent in the district, Bena matured a good sample of grain. Bobin rusted badly and was not worth harvesting. Canberra lodged badly and could not be harvested.

Bingara (C. Batterham).—Soil, a chocolate loam; wheat last season; disc ploughed February, 1930, harrowed March, springtoothed twice in April; sown with a combine 14th May, seed 45 lb. per acre, without fertiliser. The grain of Nabawa, Duri, Aussie, and Ranee was plump, although that of rust-liable varieties such as Hard Federation, Bobin, and Canberra was slightly pinched.

Pallamallawa (S. Rigby).—Soil, a greyish belar loam; wheat last season; disc ploughed January, 1930, rigid scarified and harrowed March; sown with a combine and harrowed 23rd April, seed 45 lb. per acre, without fertiliser. Varieties other than Canimbla, Waratah, Aussie, and Nabawa were badly rusted and the grain was far below average. The grain of Marshall's No. 3 was particularly light.

Wee Waa (E. Kelly).—Soil, sandy loam; wheat last season; disc ploughed February, 1930, springtoothed twice in March; sown with a combine and harrowed 12th April, without fertiliser. Varieties other than Waratah, Aussie, and Nabawa were badly rusted and not worth harvesting.

Culgoora (S. Carberry).—Soil, a greyish belar loam; wheat last season; springtoothed December, 1929, again in February, 1930, harrowed March; sown with a combine, seed 40 lb. per acre; two sowings were made—one on 2nd April and the other 24th April. Hard Federation was sown on both occasions; a slight increase was seen from the later sowing. Rust was prevalent.

Emerald Hill (W. McDonald).—Soil, a medium red loam; wheat last season; springtoothed January, 1930, and half the area springtoothed across later in January; sown with a combine and harrowed 25th April, seed 45 lb. per acre, without fertiliser.

Boggabri (C. Evans).—Soil, a red loam; disc ploughed January, 1930, springtoothed March; sown with a combine on 23rd April, seed 50 lb. per acre, without fertiliser. Rust was prevalent.

Boggabri (A. E. Bradshaw).—Soil, a medium loam; wheat last season; disc ploughed January, 1930, and again in March; sown with a disc drill and harrowed on 14th April, seed 45 lb. per acre, without fertiliser.

Maule's Creek (J. J. Kenniff).—Soil, a silty to gravelly loam; previous crop wheat; disc ploughed February, 1930, disc cultivated March, springtoothed in April; sown with a combine, seed 50 lb. per acre on 21st May, without fertiliser.

Boggabri (J. Penfold).—Soil, a chocolate loam; a light crop in 1929, which was fed off; mouldboard ploughed January, 1930, and harrowed a month prior to sowing; sown in two sections the earlier one on 1st May, and later one on 16th May, both at 45 lb. seed per acre, without fertiliser. Bobin was included in the earlier section and it yielded heavier than the remainder of the varieties in that section, but would have yielded more only for an attack of rust. The early May sowing was somewhat late for such varieties as Ford and Yandilla King.

Edgeroi (N. Barrett).—Soil, dark chocolate loam; rigid tine scarified February, 1930, harrowed March; sown on 1st May, 40 lb. seed per acre, without fertiliser. These plots were fed off till the middle of June.

Mount Russell (P. Finn).—Soil, a chocolate loam; previous crop wheat; worked with a rigid tine scarifier January, 1930, and again in March; sown on 16th May, seed 50 lb. per acre, without fertiliser.

Nullamanna, Inverell (H. Scott).—Soil, a chocolate loam; disc ploughed August, 1929, harrowed September, springtoothed October, February, 1930, March and April; sown with a combine on 13th May, seed 45 lb. per acre, without fertiliser. Rust was prevalent and Cleveland, Union and Canberra were damaged.

Pilliga (J. Miller-Williams).—Soil, red sandy loam; springtoothed in March, 1930; sown on 5th May, seed 55 lb. per acre, without fertiliser. Turvey and Union were rusted badly.

Emerald Hill (E. S. Perrett).—Soil, chocolate loam; previous crop wheat, 1929; springtoothed March; sown with a combine and harrowed on 20th April; seed 48 lb. per acre, without fertiliser.

YIELDS of Wheat Variety Trials.

	Bingara (G. Howson).	Curlewis (W. Manning).	Emerald Hill (F. Shaw).	Kelvin (J. Barwick).	Mary's Mount (F. Foster).	Boggabri (D. M. Leys).	Gunnedah (L. G. Pryor).	Delungra (A. M. Paterson).	Bingara (C. Batterham).	Pallamallawa (S. Rigby).	Wee Waa (E. Kelly).	Culgoora (S. Carberry).	Emerald Hill (W. McDonald).	Boggabri (C. Evans).	Boggabri (A. E. Bradshaw).	Boggabri (J. Kenniff).	Boggabri (G. Penfold).	Edgerol (N. Barrett).	Mt. Russell (P. Flinn).	Inverell (H. Scott)	Pilliga (J. Miller-Williams).	Inverell (W. Gilholme).	Carroll (S. Swain).	Curlewis (W. Bartlett).	Emerald Hill (E. S. Parrett).
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.
Aussie	29 16	20 40	31 5	...	23 5	12 0	...	...	36 40	23 43	10 0	16 45	37 47	...	...	21 20	...	11 4	31 21	...	...	12 0	27 35	24 7	...
Barwang	...	8 57	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bena	25 7	...	24 25	...	...	...	14*43	33 50	...	...	...	10* 0	...	12 23	...	...	...	...	...	...	...	...	...	...	...
Bobin	25 49	11 39	26 44	21 17	14 5	9 0	15*56	...	30 34	14 56	...	9* 1	31 40	15 28	...	...	25* 0	13 33	14 5	...	...	...	21 31	12 26	...
Bogan	...	...	...	...	...	...	...	...	...	...	...	...	21 40	...	...	...	...	...	...	...	...	...	...	...	...
Cadia	...	...	...	...	...	...	...	28 16	...	20 37	...	...	...	...	...	...	9*33	...	...	25 42	...	...	...	...	...
Canberra	23 58	12 56	27 53	...	...	9 0	23 39	10 1	...	...	...	...	...	...	...	...	30 34	12 5	16 33	19 56	18 0	9 0	30 46	...	15 41
Canimbla	...	...	...	...	...	...	...	33 25	...	26 7	...	...	...	...	...	...	13*39	...	25 22	26 25	...	...	...	...	...
Clarendon ...	...	14 50	30 9	17 56	27 0	9 0	...	28 0	29 40	...	...	...	...	...	...	18 40	...	...	25 49	13 29	10 0	14 0	...	25 21	16 34
Cleveland	...	...	...	...	...	...	...	28 48	...	13 26	...	...	...	...	...	...	...	...	...	17 29	...	...	...	...	...
Cookapoi	...	...	...	...	...	...	...	...	...	...	...	...	26 29	...	...	...	...	...	...	...	...	...	...	...	...
Currawa	...	...	...	...	...	9 30	...	...	...	...	...	...	...	...	21 58	...	...	2 28	22 1	...	...	...	...	...	...
Duri	30 49	17 1	29 38	24 13	23 41	12 0	...	35 57	37 7	19 46	...	16 59	...	...	...	18 40	34 10	13 48	...	21 26	21 14	9 0	37 24	25 25	...
Federation ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Florence	...	...	...	...	...	...	27 41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ford	41 48	17 21	31 17	...	...	...	24*53	39 9	...	...	...	27*37	...	27 2	...	...	23*32	...	36 45	27 2	...	13 0	25 3	...	...
Free Gallipoli ...	...	12 37	24 45	...	...	...	...	...	...	...	...	9*48	...	...	...	...	21*24	...	...	...	...	...	...	...	...
Geeralying ...	...	11 43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gluyas Early ...	...	...	...	...	...	...	22 4	...	...	...	...	...	...	...	...	...	21 53	...	...	...	...	...	...	...	...
Gresley	24 41	...	...	...	15 56	...	...	...	31 34	...	...	...	...	...	...	18 40	...	...	...	...	...	...	...	...	16 42
Gullen	...	...	...	...	...	...	20 0	...	...	...	...	11* 6	30 50	...	...	...	...	...	...	...	...	...	21 10	...	...
Hard Federation ...	23 4	8 34	27 55	...	16 24	...	9 0	...	29 48	...	...	12 57	...	15 10	...	...	...	12 0	...	...	20 11	...	28 26	18 25	11 51
Marshall's No. 3 ...	...	...	...	12* 0	...	...	...	...	...	8 54	...	...	...	...	...	...	...	1 13	14 45	...	...	...	...	...	...
Nabawa	31 21	14 3	...	20 1	24 36	...	23*35	40 0	39 48	22 51	15 11	23*34	34 58	27 30	15 37	...	31 0	7 24	29 7	29 18	15 15	9 0	29 17	19 55	...
Nizam	...	...	...	14 42	...	...	19*37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Onas	...	...	...	15 8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Penny	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pusa No. 4 ...	20 39	...	...	...	...	...	...	...	...	...	...	10 22	...	...	...	...	...	12 41	...	...	...	...	...	...	...
Queen Fan... ...	...	...	...	...	...	...	...	15 55	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rajah	24 18	16 9	...	...	...	18 0	...	...	31 34	13 54	...	...	33 49	9 31	...	...	...	...	...	...	16 0	...	24 22	19 51	...
Ranee	33 0	...	...	...	...	7 30	...	...	36 40	10 41	...	10 17	...	16 51	...	...	...	12 22	...	15 40	...	...	...	14 29	...
Riverina	...	...	...	...	19 29	...	20 34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	23 17	...
Turvey	...	8 17	...	...	...	...	...	...	...	...	...	...	...	15 52	12 11	...	...	...	...	...	7 0	...	...	...	...
Union	...	...	22 9	...	11 42	6 0	17*21	...	...	11 31	...	...	...	12 53	9 53	...	22*13	...	...	12 55	13 0	...	...	...	...
Wandilla ...	...	...	...	13*36	...	...	16*25	...	...	...	...	...	...	...	...	...	17*26	4 21	...	...	...	...	...	22 10	...
Waratah	33 32	11 33	30 51	20 26	18 45	13 30	...	33 9	35 39	24 45	8 0	20 1	34 56	28 15	...	21 20	31 42	8 46	22 22	31 8	23 4	...	31 48	19 39	...
Yandilla King ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	17 2	...	...	...	...	...	...	...	...

* Early-sown varieties in these trials.

Curlewis (W. Bartlett).—Soil, chocolate loam; disc ploughed January, springtoothed March; sown with combine 25th June, seed 50 lb. per acre, without fertiliser. Owing to late sowing of the trial rust was prevalent. Clarendon matured an excellent sample.

Carroll (S. Swain).—Soil, greyish to chocolate loam; previous crop wheat 1928, fallow 1929; disc ploughed October, springtoothed December; sown with a combine on 12th May, seed 45 lb. per acre, without fertiliser. These plots generally escaped much damage by rust; Ford was ready for the stripper three weeks to a month before harvesting took place, and consequently loss by shelling occurred.

Gum Flat, Inverell (W. Gilholme).—Soil, black basaltic loam; previous crop wheat 1929; disc ploughed January and March and harrowed; sown with combine and harrowed on 24th June, seed 58 lb. per acre, without fertiliser. Clarendon, Aussie and Ford stood up best to the rust. Nabawa, Duri and Canberra were pinched; the remainder of the varieties in the trial were not harvested.

Notes on Varieties.

The rust resistance of the varieties was a feature observed in the trials this season, for this disease was prevalent at all centres. The varieties which escaped or resisted the disease were Ford, Clarendon, Currawa, Nabawa, Aussie, Waratah, and Duri

Aussie.—Despite this variety's straw weakness and liability to flag smut it has yielded well compared with Waratah and has shown good resistance to rust this season. It should be sown on country free from flag smut.

Bobin has been deleted from the trials in this district largely on account of its liability to rust; it has shown some inability to mature a plump sample of grain under normal conditions in the district during the past three years. The variety has good straw, holds its grain well, and is fairly resistant to flag smut.

Cadia has not shown any superiority over Cleveland this season; it is liable to flag smut and rust.

Canberra was inferior to Waratah throughout the trials this season Duri will take its place very largely for a late sowing variety.

Canimbla is a promising late maturing variety which showed some signs of resisting rust this season. It was superior to Cleveland in trials at Delungra, Pallamallawa, and Nullamanna.

Clarendon, although not as heavy a yielder as Waratah, yielded consistently well this season, and in most cases resisted the rust and matured a plump sample of grain. It is still a serviceable variety for the North-west.

Cleveland still retains its popularity in the Inverell district. Although earlier-maturing, Ford promises to give better results. Cleveland is liable to both flag smut and rust.

Duri has yielded well in the trials during the past three years, and is useful for late sowing for grain in the district. It yielded better than Canberra this season and stands up much better.

Ford is a most useful variety for hay and grain in this district. It has been included in a few trials in the district during the past three seasons, and has yielded satisfactorily. This year it excelled itself on account of its resistence to rust. It is of mid-season maturity, has good straw, withstands flag smut and rust, and matures an attractive sample of grain; it is inclined to shatter.

Hard Federation suffered greatly from rust this season; it is also very liable to flag smut.

Nabawa has yielded well during the past three seasons. It is almost immune to flag smut and stands up well to rust.

Union suffered from rust this season, and has been deleted from the trials.

Rance has been yielding consistently during the past three years, but is not outstanding.

Geeralying, only tried for the first time this season, may prove to be useful for late sowing in this district.

Waratah has upheld its reputation as a serviceable variety for the district.

Bena was badly affected by rust in most instances.

Time of Sowing Experiment.

Gunnedah (B. D. Riorden).—Soil, dark chocolate loam; previous crop wheat 1928, wheat 1929 failed; disc ploughed November, 1929, springtoothed March, 1930; sown with combine, seed 45 lb. per acre. Two varieties were used, viz., Nabawa and Canberra, and the results were:—

	Sown 1st April		Sown 15th May	
	bus	lb.	bus.	lb.
Canberra	14	0	26	47
Nabawa	17	26	17	19

Rate of Seeding Tests.

Boggabri (J. Penfold).—Soil, chocolate loam; 1929 (first) crop light, and fed off; mouldboard ploughed January, 1930, and harrowed a month prior to sowing with combine on 16th May, without fertiliser, seed at 30, 45 and 60 lb. per acre; variety, Canberra.

The yields were:—

	Yield.	
Seed per acre—	bus.	lb.
30 lb.	33	23
45 lb.	29	24
60 lb.	26	30

The crops resulting from the heavier rates of seeding lodged badly and the light seeding gained an advantage.

Narrabri (A. Gett).—Soil, medium to sandy loam; previous crop wheat 1929; springtoothed January, again in March; sown 3rd May without fertiliser, seed 30, 45 and 60 lb. per acre; variety, Waratah.

The yields were:—

	Yield.	
Seed per acre—	bus.	lb.
30 lb.	24	36
45 lb.	20	15
60 lb.	17	10

The plots were damaged by frosts at the flowering stage, but less damage was apparent in the lighter seeding.

Gum Flat, Inverell (Sydney Gobbert).—Soil, chocolate loam; previously carried a light crop of maize; mouldboard ploughed June, 1930; sown 1st July without fertiliser, at rates of 45, 55 and 65 lb. seed per acre; variety Nabawa.

The yields were:—

	Yield.	
Seed per acre—	bus.	lb.
45 lb.	12	0
55 lb.	18	0
65 lb.	27	0

Swan Vale, Inverell (C. Anderson).—Soil, chocolate loam; wheat 1929; mouldboard ploughed and harrowed February, 1930, harrowed April, springtoothed twice in May and harrowed; sown with combine 17th July without fertiliser at rates of 30, 43, 58, 64 and 70 lb. seed per acre; variety, Waratah.

The yields were:—

	Yield.	
Seed per acre—	bus.	lb.
30 lb.	11	28
43 lb.	11	0
58 lb.	13	31
64 lb.	9	36
70 lb.	12	9

Carroll (S. Swain).—Soil, greyish to chocolate loam; wheat, 1928, fallow 1929; disc ploughed October, 1929, springtoothed December; sown with combine 13th May, seed at 30, 45 and 60 lb. per acre, without fertiliser.

The yields were:—

	Yield.	
Seed per acre—	bus.	lb.
30 lb.	32	28
45 lb.	30	14
60 lb.	30	11

Comment.—Under the conditions prevailing last season, the lighter rate of seeding was evidently the best rate to use. Results over the last three years indicate that a medium rate of seeding, such as 40 lb. per acre for early sowing, 45 lb. per acre up to 50 lb. for midseason sowing and 55 to 60 lb. for late sowing has given the best results.

Fertiliser Trials.

Curlewis (J. C. Wood).—Soil, light chocolate loam; grown wheat for twenty-seven years, previous crop wheat; disced January, 1930, and sown with a combine, seed 45 lb. per acre on 5th April; variety Free Gallipoli. Superphosphate at 45 lb. per acre was used on one plot and the yield compared with that of an unmanured check plot.

The yields were:—

	bus.	lb.
Superphosphate 45 lb. per acre	19	16
No manure	17	17

The grain was pinched as a result of rust.

Narrabri West (D. A. Lilliebridge).—Soil, red sandy loam, previous crop wheat; mouldboard ploughed February, springtoothed April; sown with combine on 1st May, seed 45 lb. per acre; variety Waratah.

The yields were:—

	Yield.	
	bus.	lb.
Superphosphate 35 lb. per acre	21	0
,, 50 lb. ,, ...	18	0
,, 70 lb. ,, ...	18	0
No manure	18	0

Milroy, Gunnedah (H. Gardner).—Soil, sandy loam, previous crop, wheat; springtoothed February, 1930, and March; sown with a combine on 23rd May, seed 60 lb. per acre; variety Nabawa.

The yields were:—

Fertiliser.	Yield. bus.	lb.
Sulphate of ammonia, 42 lb. per acre	24	4
No manure	23	34
Superphosphate, 47 lb. per acre	23	17
A mixture of 2 parts superphosphate and 1 part sulphate of potash, 47 lb. per acre	22	55
M17 (2 parts superphosphate and 1 part sulphate of ammonia), 47 lb. per acre	22	47
Sulphate of potash	21	48

Comment.—The results from fertiliser trials over the past three years have been so inconsistent as to render definite recommendations a difficult matter. In the above trials a slight increase was noticeable in favour of an application of superphosphate at Narrabri West and Curlewis, while a negative result was obtained at Milroy. The response from sulphate of ammonia might be explained by the unusual wet weather conditions, and a possible lack of soil nitrates consequent on cold, wet, soil conditions.

Cultivation Tests.

FALLOW EXPERIMENT.

Mary's Mount (F. Foster).—Soil, chocolate loam, which has grown wheat continuously for about eight years. The trial consisted of two plots, viz., (1) winter fallow, and (2) short summer fallow. The seed was sown at 45 lb. per acre, without fertiliser on 1st May; variety Nabawa. The cultural details were:—

PLOT No. 1 (Winter fallow).—Previous crop wheat 1928; disc ploughed September, 1929, springtoothed January, harrowed February, springtoothed March, harrowed April.

ESTABLISHMENT of PASTURES

The young plants during root establishment cannot forage to any extent for plant food. It is therefore essential when seeding a pasture to use a balanced mixture of readily available fertiliser. When the clovers become established, they are able to fix their own nitrogen and require phosphate applications only. The grasses, however, become nitrogen starved during the cold months and show little growth unless supplied with this plant food. Consequently, for the production of a good "soil cover," the exclusion of weeds, and a balance between grasses and clovers, newly sown pastures should be fertilised as follows:—

A—IN AUTUMN AT SEEDING—
2 to 3 cwts. super per acre.
1 to 2 cwts. sulphate of ammonia per acre.

B—IN JULY—
1 to 1½ cwts. sulphate of ammonia per acre.

Applications of nitrogen will, in addition, provide valuable Winter and early Spring feed.

For further particulars apply

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NITROGEN FERTILISERS PTY. LTD.
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For Pigs	**M.I.B. FOODS** will prevent cannibalism in Breeding Sows and speed up the maturity in Bacon and Porker Pigs
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For Dairy Cows	**M.I.B. BONE PRODUCTS** are rich in calcium phosphates. They aid the milk flow, prolong the lactation period and prevent deficiency diseases.

Write for further particulars to:—

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STATE ABATTOIR, HOMEBUSH BAY
via SYDNEY, N.S.W.

PLOT No. 2 (Short summer fallow).—Previous crop wheat 1929; springtoothed January, harrowed February, springtoothed March, harrowed April.

The yields were:—

	Yield. bus.	lb.
No. 1 (winter fallow) Plot	28	27
No. 2 (short summer fallow) Plot	12	0

The crop on the short fallow was thin and dirty, with black oats and other weed growth.

DEPTH OF WORKING EXPERIMENT.

Curlewis (J. Cavanagh).—Soil, chocolate loam; sown with oats in 1929 and grazed through. The trial consisted of two plots, one worked deeply at the initial and subsequent workings, and the other worked shallower throughout. The cultural details were:—

PLOT No. 1.—Disc ploughed 5 inches September, springtoothed to full depth in October, rigid scarified 3 inches December, and again in February; sown with combine 3 inches deep.

PLOT No. 2.—Disc ploughed September, 1929, 3 inches deep, springtoothed full depth October, rigid scarified 2 inches in December and again in February; sown with combine 2 inches deep.

The yields were:—

	Yield. bus.	lb.
Plot No. 1 (deep working)	26	30
Plot No. 2 (shallow working)	24	30

Better germination was obtained from the deeply worked fallow, but black oats were more prevalent. These were evidently brought to the surface from the lower depths. The variety was Wandilla.

The Oat Variety Plots.

Kelvin (J. E. Peachey).—Soil, chocolate loam; previous crop, wheat; disc ploughed January, 1930, harrowed prior to sowing with a combine on 28th April, seed 34 lb. per acre, without fertiliser. Slight loss occurred by shelling.

Bingara (G. L. Howson).—Soil, medium red loam; disc ploughed January, 1930, springtoothed April; sown with a springtooth cultivator on 4th May, seed 40 lb. per acre, without fertiliser. Plots fed off in June. All varieties except Algerian, Lachlan, Belar, and Guyra lodged badly and their yields are not comparable.

Emerald Hill (R. P. Greer).—Soil, chocolate loam; springtoothed January, 1930, February, and March; sown with a combine 14th April, seed 40 lb. per acre, without fertiliser.

Boggabri (D. M. Leys).—Soil, sandy loam; disc ploughed February, springtoothed April; sown with a combine on 24th April, seed 40 lb. per acre, without fertiliser.

Mount Russell (F. Mills).—Soil, a chocolate loam; previous crop oats; mouldboard ploughed April, rigid tyned and harrowed prior to sowing on 5th June, seed 40 lb. per acre, without fertiliser (Buddah and Belar 50 lb. per acre). Algerian and Sunrise lodged badly.

Wee Waa (J. Newnham).—Soil, red sandy loam; previous crop wheat; disc ploughed March; sown with disc drill and harrowed on 6th May, seed 40 lb. superphosphate 35 lb. per acre.

Boggabri (J. Langlens).—Soil, chocolate loam; land out to grass three years; disc ploughed January, 1930, sown with combine on 26th April, seed 35 lb. per acre, without fertiliser. Mulga lodged badly and was not harvested.

Boggabri (R. McKenzie).—Soil, medium to strong red loam; previous crop wheat; disc ploughed and harrowed March; sown with a combine on 28th April, seed 40 lb. per acre without fertiliser. Plots fed off for three weeks till 30th July.

Boggabri (J. Penfold).—Soil, chocolate loam; previous crop wheat, light and fed off; mouldboard ploughed January, 1930, harrowed one month prior to sowing with combine on 30th April, seed 40 lb. per acre, without fertiliser.

Narrabri (F. A. Richards).—Soil, alluvial loam; previous crop oats, grazed and ploughed in; disc ploughed January, 1930, harrowed twice, springtoothed once; sown with a combine on 1st May, seed 40 lb per acre without fertiliser.

Eulah Creek, Narrabri (A. Orman).—Soil, clay to chocolate loam; previous crop wheat; disc ploughed February, springtoothed March, and again prior to sowing with a combine on 22nd May, seed 40 lb. per acre, without fertiliser. The plots were damaged by windstorms; Mulga was not harvested.

Oakwood, Inverell (J. R. Georgeson).—Soil, chocolate loam; previous crop wheat; disc ploughed February, 1930, rigid tyned three times prior to sowing on 2nd May, seed 40 lb. per acre without fertiliser.

Gum Flat, Inverell (P. V .Thomas).—Soil, black basaltic loam; mouldboard ploughed February, 1930, springtoothed March; sown with combine 17th April, seed 40 lb. per acre, without fertiliser.

Nullamanna, Inverell (P. J. Gearing).—Soil, red to chocolate loam; previous crop, wheat; disc ploughed January, 1930,. harrowed February, springtoothed and harrowed March; sown with a combine on 1st May, seed 40 lb. per acre, without fertiliser.

Boggabri (F. W. Tart).—Soil, chocolate loam; disc ploughed February, 1930; sown with a combine 15th May, seed 60 lb. per acre, without fertiliser.

Delungra (J. Dufty).—Soil, chocolate loam; previous crop, wheat; springtoothed April; sown with a combine 14th May, seed 60 lb. per acre, without fertiliser.

Yields of Oat Variety Trials.

	Kelvin (J. E. Peachey).	Bingara (G. Howson).	Emerald Hill (R. P. Grier).	Boggabri (D. M. Leys).	Mt. Russell (F. Mills).	Wee Waa (J. Newnham).	Boggabri (J. Langlens).	Boggabri (R. McKenzie).	Boggabri (F. Penfold).	Narrabri (E. A. Richards).	Narrabri (A. Orman).	Inverell (J. B. Georgeson).	Inverell (P. V. Thomas).	Inverell (P. J. Gearing).	Boggabri (F. Tart).	Curlewis (J. Cavanagh).	Delungra (J. Duffy).	Boggabri (L. White).
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	30 22	43 26	12 0	3 0	40 6	21 26	38 9	30 0	11 24	19 32	15 31	26 0	48 11	32 6	13 16	26 13	44 28	29 10
Belar	35 18	35 29	25 0	12 0	41 6	28 1	19 33	23 0	10 26	10 24	33 20	24 2	39 22	22 20	27 12	20 5	38 12	16 10
Buddah	...	10 12	34 0	...	50 17	34 28	26 31	13 0	37 8	4 28	11 33	16 27	26 10	8 0	...	4 18	23 0	9 30
Gidgee	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7 10	...	...
Guyra	35 2	22 34	23 0	7 20	49 11	26 28	25 13	17 4	14 30	17 10	35 11	42 6	39 11	28 31	...	23 12	38 0	6 20
Lachlan	29 23	30 39	18 20	15 0	41 35	26 9	21 36	11 20	14 30	5 4	27 4	16 27	41 31	22 12	31 23	21 25	28 28	17 20
Mulga	30 27	4 35	26 0	...	41 29	26 17	...	25 0	37 4	9 28	...	17 26	22 20	7 4	...	19 21	...	13 0
Palestine	...	...	42 0	...	...	17 12	32 20	13 30	...	...	22 26	19 24	...	...	...	...	...	...
Reid	...	...	...	...	35 30	...	...	...	...	...	...	20 4	28 0	8 29	...	...	19 12	...
Sunrise	24 14	19 20	...	3 0	41 6	...	...	...	40 12	15 30	...	...	28 20	13 31	...	...	21 32	8 20
White Tartarian ..	...	...	...	...	...	...	...	...	...	...	...	26 30	...	...	...	...	...	...

Curlewis (J. Cavanagh).—Soil, chocolate loam; previous crop, wheat; rigid scarified December, 1929, again February, harrowed March; sown with a combine 15th April, seed 40 lb. per acre, without fertiliser. Plots fed off till end of July.

Boggabri (L. White).—Soil, gravelly loam; previous crop, wheat; disc ploughed January; sown with combine and harrowed on 18th April, seed 50 lb. per acre, without fertiliser. Plots were fed off till 20th August.

Notes on the Oat Varieties.

Considerable damage was done to the plots as a result of wind storms at harvest time. A good deal of shelling and lodging was experienced. The most consistent varieties were Mulga, Buddah, Guyra, and Belar. The late rains of October benefited Algerian, and in many cases it gave the highest yield. The earlier-maturing varieties are more serviceable for grazing in the early stages and subsequently cutting for hay or stripping for grain.

Feeding-off Tests with Oats.

Gum Flat, Inverell (G. Lenord).—Soil, a chocolate loam: lucerne sown 1929, but failed to germinate; mouldboard ploughed January, 1930, rigid scarified March; seed 30 lb per acre, ploughed in and harrowed on 24th April; variety Guyra; area 2 acres. Two cows grazed continuously from 23rd June till the end of November and 100 sheep were grazed four days per month for the same period. The oats were grazed right through, no grain was harvested.

Delungra (A. M. Paterson).—Soil, black, basaltic loam; previous crop wheat; springtoothed February, 1930; sown with a combine 22nd April, seed 46 lb. per acre, without fertiliser; varieties Mulga and Guyra, area 38 acres. The stocking was as follows:—

1,520 sheep for 24 hours, 22nd May, equal to 40 sheep per acre.
620 sheep for 23 days (29th May to 21st June), equal to 16 sheep per acre.
228 sheep for 16 days (10th July to 26th August), equal to 6 sheep per acre.

The yields were:—Guyra, 27 bushels per acre; Mulga, 12 bushels per acre.

Oakwood, Inverell (H. R. Gorfin).—Soil, chocolate loam: fallowed in 1929; disc ploughed March and springtoothed once prior to sowing; sown with combine on 14th May, seed 40 lb. per acre, without fertiliser; variety Guyra; plot 1½ acres. Grazed continuously till the end of August with sheep and then allowed to mature. The yield was 44 bushels per acre.

Caroll (W. Weakley).—Soil, a clay loam; previously sown to lucerne which failed to germinate; disc ploughed March; sown with a combine 30th April, seed 40 lb. per acre, without fertiliser. The plot was fed off at 1st July, 1930. Yield, 5 bushels per acre.

Curlewis (J. C. Woods).—Soil, a light chocolate; sown to wheat last year and fed off; disc ploughed January, 1930; sown with a combine 5th April, seed 40 lb. per acre, without fertiliser. Plot was fed off heavily on two occasions, once in May and once in June. Yield, 17 bushels 28 lb. per acre.

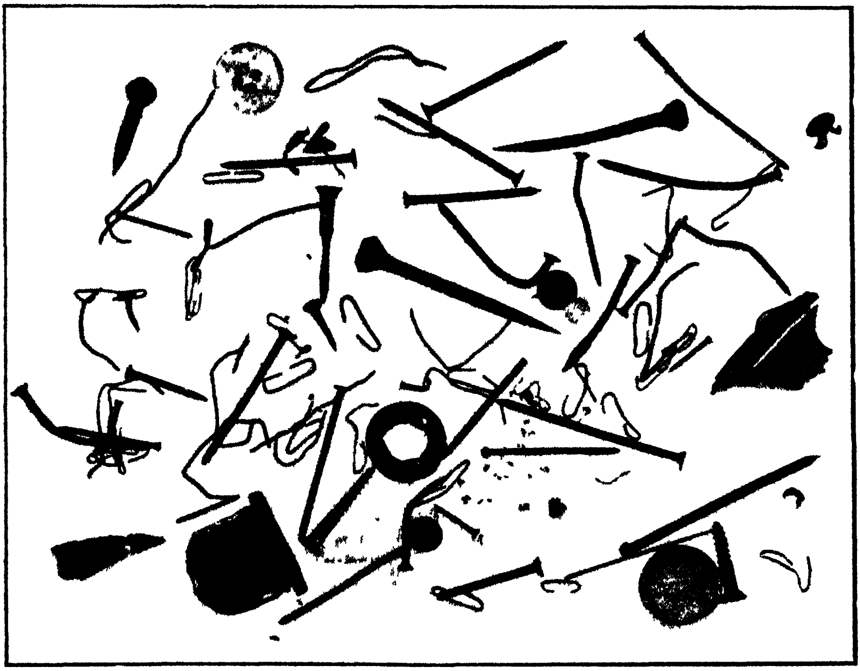
Wee Waa (J. A. Davis).—Soil, a light loam; previous crop, wheat; disc ploughed January and worked once; sown 3rd April, seed 40 lb. per acre;

variety, Mulga; area 3 acres. One acre was cut for hay and yielded 1 ton per acre. Fed off from early May till 22nd July. Yield, 15 bushels per acre.

Kelvin (F. G. Neader).—Soil, red clay and gravelly; previous crop, wheat; disc ploughed January; sown with a combine and harrowed on 2nd March, seed 45 lb. per acre, without fertiliser; variety Mulga; area 20 acres. Grazed at intervals from end of May by an average number of 150 sheep, and continuously by two to three cows. The crop was grazed right through.

OSTEOMALACIA CAUSES A DEPRAVED APPETITE.

THE collection of articles illustrated below was recently recovered from the stomach of a cow which had died from traumatic pericarditis caused by one of the sharp objects having penetrated the heart through the wall of the reticulum (second stomach). This condition occurs as a result of osteomalacia. The cattle affected with this disease develop a depraved appetite, and will frequently be noticed chewing bones, sticks, pieces of wire, and other hard objects. Naturally, when such objects are swallowed they are liable to cause disastrous results.



Taken from the Stomach of a Cow.

A pamphlet dealing with osteomalacia may be obtained from the Department of Agriculture, Box 36A, G.P.O., Sydney.—C. J. SANDERSON, Senior Veterinary Surgeon.

TRIALS WITH EARLY SOWN GRAIN WHEATS AT COWRA.

ALTHOUGH these trials were sown on a medium to heavy red granite soil perhaps a little stronger than generally found in the district, reports Mr. A. Pearson, Experimentalist at Cowra Experiment Farm, the results are interesting in that they indicate to farmers some of the newer varieties of promise worth testing out on their own properties with the idea of replacing any inferior varieties still being grown in the Cowra district.

The fallowing period was particularly dry, so much so that adequate working of the fallows was impossible and wild oats were consequently bad. The plots (1-30th acre each) were sown on 30th April with 57 lb. seed and 79 lb. superphosphate per acre. Germination was excellent and early growth rapid, while absence of frosts and an ample, well-distributed rainfall kept the crop well forward throughout the winter. A low September rainfall helped to check rank growth and prevent further lodging. Unfavourable weather during harvesting, which was carried out on 6th December, caused some delay, although a fairly uniform, good coloured sample of grain was obtained from practically all varieties.

The yields were as follows:—

YIELDS of Early Sown Wheats.

Variety.	Average Yields per acre.		Percentage Yields as compared with the Standard Variety.*
	bus.	lb.	
Dundee	46	55	143·8
Burrill	45	52	139·1
Ford	44	8	111·3
Baringa	42	15	128·8
Bena	41	19	107·8
Bredbo	40	58	111·3
Wandilla	40	28	102
Craboon	38	48	120·5
Nabawa	36	22	110·9
Exquisite	34	58	111·1
Droophead	34	50	110
Union	34	28	99·2
Canimbla	33	57	108·4
Yandilla King (Standard) ...	32	47	100
Clarkes	32	3	106·9
Cowan	30	50	100·4
Elfin	30	30	102·1
Lawson	28	32	87
Duchess	28	5	100·6
Dunmore	27	58	102
Federation	27	15	94·1

* The percentage is based on the average yields of the varieties and of the Standard for whatever period they have been under test.

The land on which the trials were carried out had been cropped with wheat and oats in 1928. Cultivation prior to sowing the trial plots consisted of skim-ploughing on 9th December, 1929, a springtooth cultivation on 7th January, a harrowing on 24th January, another skim-ploughing on 3rd February and a further springtoothing on 28th April.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36A, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Aussie	Manager, Experiment Farm, Trangie.
	J. Parslow, "Cooya," Balladoran.
Baroota Wonder	Manager, Experiment Farm, Temora.
Bobin	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Condobolin.
	W. W. Watson, "Woodbine," Tichborne
	E. J. Johnson, "Iona," Gunningbland.
	Manager, Experiment Farm, Cowra.
Bruce	L. R. Harton, "Ferndale," Werris Creek.
Canberra	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Condobolin.
	Freudenstein Bros., Post Office, Tyagong.
	W. W. Watson, "Woodbine," Tichborne.
	E. J. Johnson, "Iona," Gunningbland.
	F. Penfold, "Bluevale," Boggabri.
Canimbla	A. E. Dixon, "Bramshott," Wallendbeen.
	Manager, Experiment Farm, Cowra.
Clarendon	C. Anderson, Swan Vale Post Office, *via* Glen Innes.
	J. Parslow, "Cooya," Balladoran.
Cleveland	W. Burns, "Goongirwarrie," Carcoar.
Currawa	Manager, Experiment Farm, Temora.
Duri	Manager, Experiment Farm, Cowra.
Exquisite	P. Corcoran, "Weeroona," Moombooldool.
	Manager, Experiment Farm, Cowra.
Federation	Manager, Experiment Farm, Temora.
Firbank	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Condobolin.
Florence	Manager, Experiment Farm, Trangie.
Free Gallipoli	Manager, Experiment Farm, Temora.
Gluyas Early	Manager, Experiment Farm, Temora.
Gullen	P. Corcoran, "Weeroona," Moombooldool.
	Manager, Experiment Farm, Temora.
	W. G. Law, "Thistledown," Gilgandra.
Hard Federation	Manager, Experiment Farm, Trangie.
	L. R. Harton, "Ferndale," Werris Creek.
Improved Steinwedel	Manager, Experiment Farm, Trangie.
Marshall's No. 3	B. J. Stocks, "Linden Hills," Cunningar.
	Manager, Wagga Experiment Farm, Bomen.

Wheat—continued.

Nabawa	Manager, Experiment Farm, Trangie.
	G. Hand, "Hill View" Narromine.
	P. Corcoran, "Weeroona," Moombooldool.
	Whitfield Bros., "Gamble," Binnaway.
	R. B. B. Gibbes, "Glenmore,"Old Grenfell Rd., Forbes.
	Manager, Experiment Farm, Condobolin.
	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
	A. D. Dunkley, "Bon Lea," Brundah, Grenfell
	H. J. Harvey, "Kindalin," Dubbo.
	G. R. Lee, "Oakwood," Dubbo.
	W. G. Law, "Thistledown," Gilgandra.
	J. Parslow, "Cooya," Balladoran.
	R. Massingham, "Aylmerton," Binnaway.
	J. Berney, "Eurimbla," *via* Cumnock.
	A. P. Unger, "Stony Hill," Alectown.
	B. J. Stocks, "Linden Hills," Cunningar.
	R. G. Norris, "Morven," Coolah.
	E. Idiens, "Kangarooby," Goolagong.
	F. Penfold, "Bluevale," Boggabri.
	W. W. Watson, "Woodbine," Tichborne.
	J. P. Cullen, "Redbank," Dubbo.
	Quirk and Everett, "Narrawa," Wellington
	E. J. Johnson, "Iona," Gunningbland.
	E. Jones, "Iona," Narromine.
Ranee	A. G. Manning, "Irriga," Ungarie.
Turvey	W. W. Watson, "Woodbine," Tichborne.
Wandilla	Whitfield Bros., "Gamble," Binnaway.
Waratah	Manager, Experiment Farm, Trangie.
	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Condobolin.
	T. W. Abberfield, "Wongo Creek," Alexander Park
	G. Hand, "Hill View," Narromine.
	Manager, Experiment Farm, Temora.
	S. E. Nash, "Lockwood," *via* Canowindra.
	W. W. Watson, "Woodbine," Tichborne.
	E J. Johnson, "Iona," Gunningbland.
	A. E. Dixon, "Bramshott," Wallendbeen.
	B. J. Stocks, "Linden Hills," Cunningar.
	E. Idiens, "Kangarooby," Goolagong.
	F. Penfold, "Bluevale," Boggabri.
Yandilla King	Whitfield Bros., "Gamble," Binnaway.
	Manager, Experiment Farm, Temora.
	A. E. Dixon, "Bramshott," Wallendbeen.
	S. E. Nash, "Lockwood," via Canowindra.
	B. J. Stocks, "Linden Hills," Cunningar.
	Manager, Wagga Experiment Farm, Bomen
	Manager, Experiment Farm, Cowra.

Oats—

Algerian	Manager, Experiment Farm, Temora.
	C. Bennett, Forbes-road, Cowra.
	A. E. Dixon, "Bramshott," Wallendbeen.
	J. Pearce, Mandagery.
	H. E. Ward, "Gwenvale," Parkes.
	Manager, Experiment Farm, Cowra.
Belar	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
	D. H. Deering, "Kurralta," Piambra.
	H. E. Ward, "Gwenvale," Parkes.
Buddah	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.

Oats—continued.

Gidgee	Manager, Experiment Farm, Temora. Manager, Experiment Farm, Trangie.
Guyra	H. R. King, " Mangay," Kingsvale.
Lachlan	Manager, Experiment Farm, Temora. A. E. Dixon, " Bramshott," Walleadbeen. H. McFadyen, " Lochbine," West Wyalong.
Mulga	Manager, Experiment Farm, Trangie. Manager, Experiment Farm, Temora. Manager, Experiment Farm, Condobolin. Manager, Experiment Farm, Cowra. N. S. Meek, Hobby's Yards, *via* Newbridge. C. Bennett, Forbes-road, Cowra. H. E. Ward, " Gwenvale," Parkes. A. Head, " Springwood," Cookamidgera. D. H. Deering, " Kurralta," Piambra.
Sunrise	Manager, Experiment Farm, Trangie. Manager, Experiment Farm, Cowra.
Field Peas—	
Black Eye	H. Garside, Dartbrook, Aberdeen.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1931.

Kempsey (E. Mitchell)	April	15, 16, 17
Stroud (C. E. Price)	,,	17, 18
Orange (G. L. Williams)	,,	21, 22, 23
Wingham (C. A. Blenkin)	,,	22, 23
Grafton	,,	22 to 25
Richmond (R. B. Tate)	,,	23, 24, 25
Maclean (T. B. Notley)	,,	29, 30
Wallamba (A. E. Carey)	April	30, May 1
Casino (E. J. Pollock)	May	5, 6, 7
Trangie (F. H. Hayles)	,,	19, 20.
Cootamundra Sheep Show (G. B. Black)	July	21, 22
Young Sheep Show (Thos. A. Tester)	,,	29, 30
Peak Hill (W. Crush)	Aug.	4, 5
Trundle (W. P. Forrest)	,,	18, 19
Lake Cargelligo (C. W. Hutchens)	,,	18, 19
Illabo (J. McCarthy)	,,	19
Condobolin (J. M. Cooney)	,,	25, 26
Ungarie (D. R. Bedford)	,,	26
Wagga (F. H. Croaker)	,,	25, 26, 27
West Wyalong (A. Andrew)	Sept.	1, 2
Grenfell (P. Mylecharane)	,,	1, 2
Murrumburrah (W. Worner)	,,	1, 2
Bogan Gate (J. T. A'Beckett)	,,	2
Burrowa (S. G. Hughston)	,,	3 4
Barmedman (S. S. Penberthy)	,,	5
Young (Thos. A. Tester)	,,	8, 9
Cowra (E. P. Todhunter)	,,	15, 16
Temora (J. M. McInnes)	,,	15, 16
Junee (G. W. Scrivener)	,,	22, 23
Canowindra (W. E. Frost)	,,	22, 23
Barellan (W. H. McRae)	,,	23
Ardlethan (Les Smith)	,,	30
Berrigan (R. Wardrop)	,,	30
Hay (G. C. McCracken)	Sept.	30, Oct. 1
Narrandera (J. D. Newth)	Oct.	6, 7
Ariah Park (Mort Collings)	,,	7
Quandialla (Stuart Tomkins)	,,	7
Griffith (M. E. Sellin)	,,	13, 14
Bribbaree (J. Aston)	,,	14
Cootamundra (G. B. Black)	,,	20, 21

INFECTIOUS DISEASES REPORTED IN FEBRUARY.

THE following outbreaks of the more important infectious diseases were reported during the month of February, 1931 :—

Anthrax	2
Blackleg	3
Piroplasmosis (tick fever)	5
Pleuro-pneumonia contagiosa	4
Swine fever	Nil.
Contagious pneumonia	Nil.
Necrotic enteritis	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

WINTER FODDERS FOR THE LOWER NORTH COAST.

As in previous years the Agricultural Bureau branches in the Lower North Coast district conducted a winter fodder crop competition last season. A detailed report of this contest was published in the January *Bureau Record,* the official organ of the Agricultural Bureau movement.

Early adverse weather conditions interfered with the cultivation of the plots and sowing operations, while floods in June, followed later by dry, windy conditions, were responsible for low yields.

The competition results were as follows:—

AWARDS in Winter Fodder Contest, 1930.

Competitor.	Branch of Bureau.	Crop	Suitability of Crop for Fodder	Leafiness and Succulence.	General Appearance.	Stage of Maturity.	Freedom from Disease (Rust).	Plot Yield (in tons).	Points (2 per ton).	Total points.
		Maximum ...	(30)	(15)	(15)	(15)	(10)			
1. Alex. Smith and Sons.	Bandon Grove...	Sunrise oats, Canberra wheat, peas and vetches	26	13	14	14	7	14	28	102
2. Mrs. P. B. Martin	Krambach ...	Gresley wheat, peas and vetches.	24	14	13	13	7½	13½	27	98½
3. A. R. Lean ...	Fosterton ...	Sunrise oats, Canberra wheat, peas and vetches	26	11½	13	13½	8	12	24	96
4. G. Dowling ...	Bandon Grove...	Sunrise oats, Canberra wheat, peas and vetches	25	11½	12½	14	7	13	26	96
5. W. Lee ...	Hannam Vale ...	Sunrise oats, Florence wheat, peas and vetches	25	10	12	13	8	12½	25	93
6 G. Germon ..	Fosterton ...	Sunrise oats, Gresley wheat, peas and vetches	26	10	10	12½	7	13½	27	92½
7. A. R. Lean ...	Fosterton ...	Mulga oats, Gresley wheat, peas and vetches	23	10	14	14	7	11½	23	91
8. — Sanders ...	Austral Eden ...	Thew wheat and field peas.	22	13	12	12	8	12	24	91
9. C. Schreider ...	Krambach ...	Buddah oats	21	10	12	13	7	10½	21	84
10. Bosworth Bros.	Fosterton ...	Mulga oats, Gresley wheat, peas and vetches	21	9½	10	12	7	11	22	81½
11. V. Hegarty ...	Bandon Grove ..	Mulga oats, wheat and peas	21	9	12	13	6	9	18	79
12. — Sanders ...	Austral Eden ...	Sunrise oats and peas ...	20	10	12	12	8	8½	17	79
13. E. Kingston ...	Bandon Grove...	Sunrise oats	20	9	12	12	5	9	18	76

Commenting on these results, Mr. J. M. Pitt, Senior Agricultural Instructor, who judged the competition, states that plots of mixed fodders were again popular with competitors and can be recommended for the Lower North Coast. Sunrise was again the best oat, although not free from rust. Mulga, however, was more susceptible to this disease. Gresley and Canberra wheats both gave satisfaction and are suitable to sow with oats, while there is no doubt in Mr. Pitt's mind as to the value of Woolly-podded Vetch, which he claims is likely to supplant all other vetches for inclusion in mixed plots. A more extensive use of fertiliser could have been adopted with advantage.

REDUCTION IN PRICE OF PEDIGREE SEED FROM EXPERIMENT FARMS.

THE Department of Agriculture has decided to reduce considerably the prices charged for pedigree seed from the experiment farms. The revised prices are 4s. per bushel for wheat, 3s. per bushel for oats, barley and rye, and 4s. 6d. per bushel for Skinless barley, free on rail at sending station.

Feeding Wheat to Live Stock.

S. L. BLACK, M.R.C.V.S., Veterinary Surgeon, Department of Agriculture.

A CONSIDERABLE amount of attention is at present being given to the possibility of making profitable use of wheat as a food for live stock in New South Wales. This cereal has in the past largely been used for human consumption, with the result that information regarding its value for feeding domestic animals is to some extent limited.

The following table indicates the approximate percentage of important food principles in wheat as compared to oats and maize :—

	Wheat.	Oats.	Maize.
	per cent.	per cent.	per cent.
Proteins	12·4	12·4	10·1
Carbohydrates	73·4	70·5	72·5
Fats	2·1	4·4	5·0
Ash	1·9	3·5	1·5

It will be seen that the ash content of wheat is greater than maize and less than oats. This ash content is of importance when the amount of any particular mineral in a food falls below that required by the animal. With cereals, particularly maize and wheat, there is a deficiency of lime. When, therefore, cereals are used as concentrates, it will frequently be advisable to use some material rich in lime such as legumes or a calcium rich salt lick.

It will further be noticed from the above figures that there is a considerable fat deficiency in wheat as compared with oats and maize. This deficiency of oil or fat renders the grain less palatable to stock and less readily mixed with the saliva. Instead of incorporating itself with the saliva in a similar manner to more oily cereals, wheat meal when fed alone forms a pasty mass in the mouth. This fact is of some importance from the feed point of view, inasmuch as the digestibility of the grain is thereby adversely affected. In a non-ruminating animal such as the horse, where the stomach is simple and of relatively small capacity, food requires proper mastication and mixing with the saliva before being swallowed, otherwise the animal's digestion is liable to become seriously impaired. Ruminants are in a better position to deal satisfactory with the grain on account of the preparation which the food has undergone before having entered the fourth or true stomach.

Horses.—Wheat may, nevertheless, be fed to horses to advantage provided due discretion is exercised in its use. On account of the fact that the grain is small, hard and difficult to masticate properly, it should be fed as ground or rolled wheat. It should be fed in moderate quantities only (up to 7 or 8 lb. per day), and should before using be mixed with some bulky material such as bran or chaff or a mixture of both. The advantage of mixing it in this way is that the wheat is kept disintegrated and the bolus of food thereby enabled to mix more thoroughly with the saliva.

When it is desired to change the concentrate of horses from oats to wheat, the change should be made gradually in order to allow the animal's digestive organs to become slowly accustomed to the new diet.

Conditions other than digestive trouble which may follow the indiscriminate feeding of wheat to horses are laminitis and skin ruptures. Provided, however, that due precautions as mentioned are taken there is not much fear of these troubles occurring.

Cattle.—Experiments conducted in various countries have shown that wheat can be fed with satisfaction to dairy cows. In America it was found equal to maize for milk production. An experiment in Ireland indicated that six parts by weight of wheat in the ration gave slightly better results than four parts of oats plus two parts of bran, whereas in Denmark it was found that a ration containing 5·2 lb. of wheat gave equal results to the same quantity of mixed oats and barley.

Like other cereals wheat is low in proteins for milk production and should if possible be fed to dairy cows with some protein rich food such as linseed meal and bran.

A good meal mixture can be prepared as follows:—

4 parts ground wheat,
1 part bran,
1 part linseed meal.

The amount of this concentrate fed would vary according to the class of cow, the quantity of milk given and the class of bulky food supplied. To the average milking shorthorn cow it could be fed on the basis of 3·5 lb. of the mixture to every gallon of milk given.

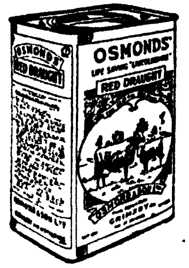
Wheat can, of course, be used as a sole concentrate for dairy cows provided some nitrogenous bulky food is given, such as lucerne chaff or other legume. A mixed concentrate is, however, to be preferred. As in the case of horses, it should be fed to cattle not whole but as ground or rolled wheat.

For calves a mixture of two parts of ground wheat to one part of linseed meal constitutes a good meal ration. Some add this concentrate to the milk, but this is inadvisable as the meal is then less thoroughly mixed with the saliva. The average sized calf of six to eight weeks old will eat about half a pound of meal mixture daily, and at three months old will consume up to 1½ to 2 lb., with increasing amounts as it grows older.

As portion of the ration for fattening cattle, wheat has given better results than oats.

Sheep.—Wheat is preferably fed whole to sheep. In America it is considered slightly superior to maize for these animals, but the experience in this country is that maize gives better results. This is to some extent due to the fact that in Australia grain is generally fed to sheep from the ground,

More Milk Means Greater Profits !



A cow drenched with Osmond's Red Draught will give a greater flow of milk than an undrenched cow, and will also maintain the increased yield over a longer period.

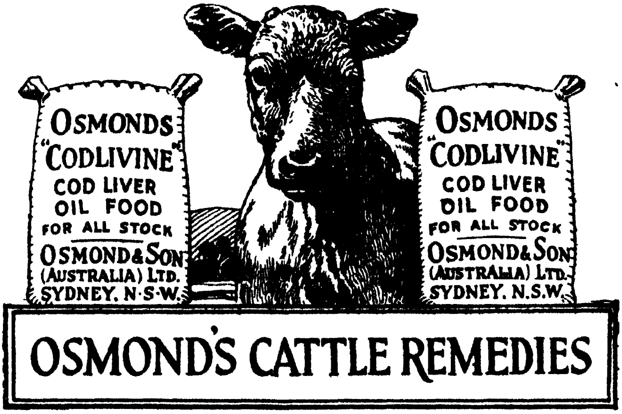
"OSMONDS RED DRAUGHT"

An after calving and general cow drench. Invaluable for the treatment of loss of cud, indigestion, and low condition.

Prepares the cow for Calving and wards off milk fever. Sold in air-tight and damp-proof canisters.

No. 1, approx. 60 drenches, 63/-; No. 2, approx. 30 drenches, 32/6

"OSMOND'S CALF CODLIVINE"



Codlivine is manufactured from the purest North Sea Cod Liver Oil, together with carefully selected ingredients, which include the most nutritious meals. A sweet mixture is produced, having great tonic and digestive properties.

Cod Liver Oil has a feeding value quite equal to new milk at a third of the cost. Codlivine added to separated milk replaces the valuable elements required for rapid growth. Codlivine is economical to use.

4 ozs. of Codlivine are sufficient for 6-8 calves.

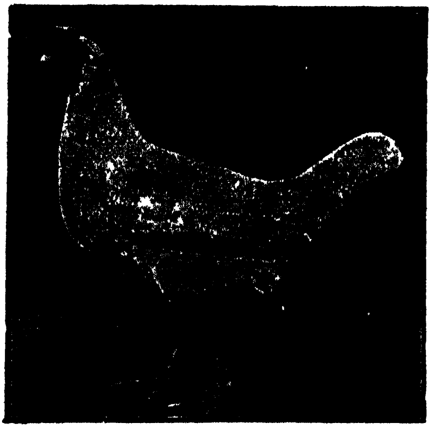
Useful in preventing scour and wasting diseases.

63/- per 100lb. bag; 32/6 per 50 lb. bag.

OSMOND & SON (Australia), LTD.
206-208 St. John's Road, Glebe, SYDNEY.

DEPARTMENT OF AGRICULTURE.

STUD POULTRY



ORPINGTONS, LEGHORNS, LANGSHANS.

Available from the following Poultry Sections:—
HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND;
THE GOVERNMENT POULTRY FARM, SEVEN HILLS;
WAGGA EXPERIMENT FARM, WAGGA;
GRAFTON EXPERIMENT FARM, GRAFTON.

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Available from Hawkesbury Agricultural College only.

Birds bred under expert direction and grown on free range.

The class required to improve farm flocks.

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G. D. ROSS, Under Secretary,
Department of Agriculture,
SYDNEY.

and not from troughing. There is obviously considerable risk that clay and sand will be picked up with the smaller grain when fed in this manner and that being the case such good results could not be expected.

Pigs.—For young and growing swine wheat is much superior to corn. For fattening purposes they are about equal, but the quality of bacon produced from wheat-fed pigs is considered superior. In a test conducted to determine its value against a combined ration of pollard and bran, six parts of wheat were found to have a greater feeding value than four parts of pollard plus two parts of bran.

As with horses and cattle, it should be used as ground or rolled wheat and should be soaked for six to twelve hours before being used. It is preferably fed as a thin slop. The slop is best prepared by the addition of skim-milk as this serves the dual purpose of balancing the ration by the addition of protein and also breaks down and softens the food to the desired consistency. When milk is not available it will, of course, be necessary to use water, but some protein-rich material should then be added, such as 5 to 10 per cent. meat meal.

Poultry.—Whole wheat constitutes a valuable grain ration for poultry, and can be used either alone or mixed with cracked corn.

With regard to the quality of wheat for feeding live stock, it can be said that pinched or shrivelled grain is in many instances almost equal in feed value to wheat of good milling quality. It should, however, be clean and free from moulds.

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with the view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected orange buds to nurserymen during the 1930 budding season, trees from which should be available for planting during the 1931 planting season :—

	Buds of Washington Navel.	Buds of Late Valencia.
T. Adamson, Ermington	3,000	3,000
W. Beck, Epping...	1,000	1,000
A. T. Eyles, Rydalmere	3,000	2,000
J. de Freitas, Fairfield	200	200
R. Hughes, Ermington	1,000	1,000
L. P. Rosen and Son, Carlingford	5,000	1,200
B. E. Yarnall, Ourimbah	100	100

—C. G. SAVAGE, Director of Fruit Culture.

TUBERCLE-FREE HERDS.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
James Wilkins, Jerseyville, Muswellbrook	51	12 Mar., 1931
Tudor House School, Moss Vale...	8	21 ,, 1931
Lunacy Department, Parramatta Mental Hospital	89	23 ,, 1931
G. A. Parish, Jerseyland, Berry	103	27 ,, 1931
Lunacy Department, Kenmore Mental Hospital	76	28 ,, 1931
Hawkesbury Agricultural College (Jerseys)	160	1 April, 1931
St. Joseph's Girls' Orphanage, Kenmore	10	3 ,, 1931
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	202	8 ,, 1931
Grafton Experiment Farm (Ayrshires)	180	5 ,, 1931
St. Michael's Novitiate, Goulburn	5	3 ,, 1931
Kyong School, Moss Vale	8	4 ,, 1931
St. Joseph's Convent, Reynold-street, Goulburn	4	4 ,, 1931
St. John's Boys Orphanage, Goulburn	7	5 ,, 1931
Marion Hill Convent of Mercy, Goulburn	10	6 ,, 1931
Cowra Experiment Farm	29	6 ,, 1931
Department of Education, Hurlstone Agricultural High School	45	10 ,, 1931
Navua Ltd., Grose Wold, via Richmond (Jerseys)	18	29 ,, 1931
Australian Missionary College, Cooranbong	45	30 ,, 1931
J. P. McQuillan, Bethungra Hotel, Bethungra	6	1 May, 1931
George Rose, Aylmerton	8	28 ,, 1931
Department of Education, Gosford Farm Homes	30	3 June, 1931
F. C. Kershaw, Macquarie House, Macquarie Fields	71	5 ,, 1931
P. Ubrihien, Corridgeree, Bega	114	6 ,, 1931
William Thompson, Masonic School, Baulkham Hills	48	13 ,, 1931
Gladesville Mental Hospital	42	25 ,, 1931
J. F. Dowe, "Woolomol," Tamworth	48	19 July, 1931
A. L. Logue, Thornbro, Muswellbrook	40	28 ,, 1931
A. H. Webb, Quarry-road, Ryde	6	26 ,, 1931
A. Shaw, Barrington (Milking Shorthorns)	122	9 Aug., 1931
E. P. Perry, Nundorah, Parkville (Guernseys)	22	18 ,, 1931
Wagga Experiment Farm (Jerseys)	55	14 ,, 1931
Sacred Heart Convent, Bowral	12	20 ,, 1931
St. Patrick's College, Goulburn	8	22 ,, 1931
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	46	22 ,, 1931
James McCormack, Tumut	111	29 ,, 1931
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	81	12 Sept., 1931
S. L. Wills, Greendale Dairy, Cowra	37	19 ,, 1931
Wolaroi College, Orange	10	4 Oct., 1931
Riverstone Meat Co., Riverstone Meat Works, Riverstone	104	11 ,, 1931
E. S. Cameron, Big Plain, Narrandera...	28	14 ,, 1931
J. L. W. Barton, Wallerawang	17	17 ,, 1931
Newington State Hospital and Home	108	24 ,, 1931
J. F. Chaffey, Glen Innes (Ayrshires)	75	4 Nov., 1931
Lunacy Department, Callan Park Mental Hospital	29	13 ,, 1931
J. Davies, Puen Buen, Scone (Jerseys)	85	14 ,, 1931
Wollongbar Experiment Farm, Lismore (Guernseys)	129	21 ,, 1931
Tamworth District Hospital	7	24 ,, 1931
Department of Education, Brush Farm, Eastwood	6	9 Dec., 1931
Bathurst Experiment Farm (Jerseys)	21	16 ,, 1931
H. A. Corderoy, Wyuna Park, Comboyne (Guernseys)	59	8 Jan., 1932
New England Girls' Grammar School, Armidale	29	10 ,, 1932
C. J. Parbery, Allawah, Bega	119	10 ,, 1932
New England Experiment Farm, Glen Innes (Ayrshires)	87	12 ,, 1932
R. C. Dickson, Elwaton, Castle Hill (Jerseys)	17	20 ,, 1932
Lunacy Department, Morisset Mental Hospital	22	28 ,, 1932
Lidcombe State Hospital and Home	146	11 Feb., 1932
Riverina Welfare Farm, Yanco	77	25 ,, 1932
Department of Education, Yanco Agricultural High School	38	26 ,, 1932
W. M. McLean, Five Islands Rd., Unanderra...	78	27 ,, 1932
Kinross Bros., Minnamurra, Inverell (Guernseys)	66	5 Mar., 1932
Burtenshaw, P. M., Killean, Inverell	60	5 ,, 1932
Miss Brennan. Arrankamp, Bowral	10	6 ,, 1932

—MAX HENRY, Chief Veterinary Surgeon.

A Study of Anthesis in Cultivated Oats.*

ALLAN R. CALLAGHAN, D.Phil. (Oxon.), B.Sc. (Oxon.), B.Sc.Agr. (Syd.).

Introduction.

ZADE (11) has written a detailed account of anthesis in oats, based upon the experience of five years' careful study; the general details of his thesis are supported by the French authors Denaiffe and Sirodot (5). Whilst a review of these standard works, with perhaps some minor modifications, might suffice as an account of the anthesis of oats under English conditions, such would be inaccurate as a treatment of the subject from the Australian standpoint. From a comparison of observations and records made in England during the years 1926 and 1927 with similar data collected since then in New South Wales, it would seem that although the general trend of anthesis follows the same underlying rules, certain fundamental features of the process are markedly different. The purposes of this paper, therefore, will be best served by taking due cognisance of the above references, together with their verification for English conditions; in this way a comparative background of extreme value will be afforded.

The course of flowering of panicles, and of spikelets within a single panicle follows, without exception, the sequence of their respective developments, and for this reason brief reference to developmental phases, as described by the author (3), will serve to make the foregoing matter clearer. The inflorescence of the main axis is the first to develop, the panicles of secondary axes receiving initiation in the order of their importance. The spikelet terminating the rachis is the first of the panicle to develop, and terminal spikelets of the main rachis branches are first of the nodal groups to develop, the sequence of development commencing with the terminal spikelet and progressing to the lowest morphologically placed spikelets of the panicle. Incidentally it should be added that the lowest or primary floret of each spikelet precedes the other floret or florets in development.

The Process of Flowering.

The time of day, the temperature, and the humidity of the atmosphere are the chief factors affecting anthesis.

Unlike wheat and other cereals, afternoon pollination takes place in oats; glume separation seldom commences before 2 p.m., the florets are rarely open before 3 p.m., and, normally, flowering reaches a climax between 4 p.m. and 5 p.m., gradually ceasing towards evening. In England blossoming is usually at its height between 3 p.m. and 4 p.m., and these hours are quoted by Zade and Denaiffe and Sirodot as representing the climax of oat anthesis in Germany and France respectively. At Cowra in 1929 flowers were noted to blossom as late as 6·30 p.m., but according to Zade anthesis may be observed at 8 p.m., and, although very unusual, even later.

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* Paper read at the Brisbane meeting of the Australasian Association for the Advancement of Science, 1930.

The other influencing factors, temperature and the humidity of the atmosphere, are very important. Ideal conditions for flowering prevail the day following rain, and especially under sultry conditions when the air is warm and laden with moisture. Zade states that if the temperature is below 15 to 17 deg. Cent., and especially if the air is dry, flowering sets in several hours later than under more favourable circumstances of warmth and humidity. Certain it is that in Australia a cold dry atmosphere delays flowering not only for several hours, but even for a day or more. It would seem that the plant is able to postpone flowering of a certain number of florets for a maximum period of approximately two days, pending the development of more favourable flowering weather; should unfavourable conditions persist, however, flowering will proceed, but full blossoming as indicated by the wide gaping of the glumes will not ensue, two or all of the anthers shedding their pollen without ever reaching the exterior. On the other hand Fruwirth ([7]) has observed, and he is supported by Zade, that excessive heat causes a delay in the time of flowering; it is probable that the high day temperatures in Australia account in some measure for the climax of flowering between 4 p.m. and 5 p.m., an hour later than is the case in the oat-growing regions of Europe.

The first signs of anthesis are a slight separation of the flowering glume (lemma) and palea at the tip, and the permanent enlargement or distention of the anthers accompanied by a change of their colour from a greenish-yellow hue to a deep ripe-yellow. The preliminary separation of the flowering glume and palea is usually in evidence about 2 p.m. to 3 p.m., preceding the actual gaping apart of the glumes by various intervals of time of an hour or more, or less frequently it may be followed immediately by the latter.

It is of universal supposition that in cereals as in other graminaceous flowers, the enlargement of the lodicules as a result of increased turgidity is responsible for leverage apart of the flowering glume and palea. The extent to which these glumes open is controlled by temperature and humidity; it varies also in different varieties, and in the individual florets of the spikelet. In a three-flowered spikelet the glumes of the lower floret separate the widest, amounting to 50 or 60 degrees when fully expanded, whilst the angle of separation of the second and third is successively smaller. It was noted, however, that on occasions when the first and second florets blossomed simultaneously, the gaping of the glumes in each case was approximately the same, the glumes of the primary floret being less widely expanded than usual.

When the bracts have fully separated, the two feathery stigmas of the flower spread apart from one another, this also as a result of increased turgidity. Zade notes that the stigmas after having spread apart cling closely to the inner walls of the glumes, but that sometimes during anthesis the stigma-branches can be seen protruding slightly from between the gaping glumes, and only occasionally are they quite conspicuous. Whilst this is substantiated by observations made in England, it cannot be said to apply as the general rule in New South Wales. Here the feathery stigmas are more often clearly visible, and are a conspicuous feature of flowering.

Concurrently with the separation of the flowering glumes and the spreading of the stigma-branches, the filaments of the anthers undergo rapid elongation; at this stage the anther lobes are fully distended and posses a deep yellow colour indicative of ripeness preparatory to dehiscence. In the cooler oat-growing regions of the world it is agreed that it is not usual for all three anthers to reach the outside of the floret, although their filaments have, without exception, extended. Zade states that as a rule only the anterior one is seen outside, whilst the two situated in a latero-posterior position are held fast within the in-rolled side flanges of the palea. He continues by saying that cases do occur when all three anthers project to the exterior, and on the other hand they all may remain invisible, though the latter, however, is very rare. Oats in full bloom in Australia do not show these distinctions; the three anthers are more often completely liberated than not, and hang out from between the glumes. This latter phase of flowering is quite a phenomenon in the oat-fields of this country between 4 p.m. and 5 p.m., when conditions are particularly suitable for flowering. The anthers so liberated, and especially when fanned by a gentle breeze, scatter the remainder of their pollen free and the atmosphere becomes laden with pollen. A simple demonstration of this is readily afforded by exposing a lightly glycerined watchglass to the air when flowering is most vigorous; in a short time accumulated pollen is visible on the glass without even the aid of a lens. Especial attention is drawn to this, for proceeding with either emasculation of flowers or the pollination of those already emasculated, after 3 p.m., is courting trouble, for there can be no certainty that foreign pollen will not pollinate accidentally during manipulation.

The closing phases of anthesis are indicated after pollination by the gradual drawing together of flowering glume and palea. They do not revert to their original pre-flowering closure, but remain partially apart for quite a considerable time, or even indefinitely, their half open condition being a normal indication that flowering has recently taken place.

The exact time of anther dehiscence is of far-reaching significance. Fruwirth (7) says that the opening of the anthers, which is quite sudden, only follows when the anthers have made their way past the stigma-branches, and very soon after the gaping of the glumes, and that the pollen is thus liberated in such a way that it is scattered. He states further, that in flowers of which not all three anthers hang out, the anthers which are retained within the glumes dehisce at the same time as (or, at any rate, an insignificant time later than) the one that is hanging free. From these statements it appears that under such circumstances the pollen partly reaches the outside, but also that it is partly poured out upon the stigma within one and the same flower. Zade confirms this from the evidence of investigations of a great number of flowers in the most varied years and under most dissimilar circumstances. Observations made at Cowra last season substantiate these views, with the exception that the explosive dehiscence of the anthers may, under some circumstances, be delayed until all three are hanging free from the glumes. On a particularly still day of last year two such cases were noticed, in each case the anthers were lightly touched with a pencil and dehiscence of the three anthers was immediate.

From the foregoing it is obvious that in Australia the possibilities of natural crossing in oats are greater than they are in cooler countries, where it is usual for one at least of the anthers to be retained within the confines of one or other of the glumes. In the latter instances the stigma-branches of the flowers are, as a rule, already strewn with pollen grains before any free pollen from neighbouring plants has had time to reach the stigma in question. Even so, it must occasionally happen under the above circumstances, and more often under our conditions, that the interval between self-pollination and the appearance of pollen from another flower is only extraordinarily short, and it is quite feasible that in some of these cases cross-fertilisation results. It is interesting to note that Zade observed one case in which the anthers had completely emerged prior to dehiscence, and in this instance, the stigma remained free from pollen of the same flower and was thus open to cross-fertilisation. Further he observed, by microscopical investigation, two cases in which the pollen, although certainly shed at the normal time, did not reach the stigmatic surfaces, but strangely enough, in both cases some pollen had reached the inner walls of the glumes, although the stigmas as stated, had received none. In these cases, however, self-fertilisation was certainly not wholly excluded, for with the closing of the glumes, the retreating stigma-branches might quite conceivably have come into contact with the pollen still clinging to the inside of the glumes, thus leading to a postponed fertilisation. In Australia these possible deviations from the normal course of affairs probably occur more often, and by making detailed observations here, such as Zade has made in Germany, it seems highly probable that a greater number of cases would be found in which pollen shed after the stamen filaments have extended does not reach the stigma of the same flower.

It is important to emphasise that all such occurrences as those cited are exceptions, still they serve to indicate that the process of flowering is not always schematic, but may vary widely as a result of possible combinations of exceptional behaviour, such as those already mentioned, between the individual parts of the flower concerned in the process. Some of such variations may occasionally lead to cross-fertilisation, and whilst it is impossible to make an explicit and generally applicable statement as to the percentage of cross-fertilisation in oats, it is probable that it happens more frequently than is usually accepted. It is worthy of note before closing the discourse on the probability of natural crosses, that the pectinate drooping of the spikelets of the majority of oat varieties makes natural crossing increasingly difficult.

Several cases of natural crossing in oats have been reported in Australia, and it seems certain that natural cross-pollination does occur more frequently in Australia than it does in the cooler oat-growing zones of the world. In these latter regions definite evidence of occasional natural crossing in the main cereals has accumulated, both from observations and experimentation. To quote one instance, Stanton and Coffman (9), by experiment, showed that at Akron, Colorado, in 1922, natural crossing occurred in oats to the extent of 0·36 per cent. The data they obtained also indicated that the extent of natural crossing varied in different varieties and also in different selections within the varieties.

Whilst no figures can be quoted here to show the percentage of natural crossing, evidence that such does occur in the field can be conclusively given. Two black-grained selections were isolated from a field of Algerian oats at Bathurst in 1928, and in 1929 their progeny was studied. Both selections segregated for all grain characters, indicating that they were probably the progeny of natural crossbreds between Algerian and the wild oat (*Avena fatua.*) A study of the characters of pubescence of the rachilla and non-pubescence of the rachilla will serve to authenticate the observations. Odland (8) has shown that glabrous rachilla contrasted with pubescence rachilla breeds as a single factor difference in the ratio of 3 : 1. One of the Bathurst selections produced progeny, fifty-five of which had glabrous rachillas, and twenty-five had pubescent rachillas, giving a calculated ratio of 2·75 : 1·25. The observed deviation from a 3 : 1 ratio here is 0·25 ± 0·1306. The observed deviation is not quite twice its probable error, indicating that the ratio of 2·75 : 1·25 is covered by the limits of error. The second plant segregated similarly, giving fifty plants with glabrous rachillas and eighteen pubescent, giving a calculated 3 : 1 ratio of 2·9411 : 1·0588. The observed deviation in this instance is 0·0588 ± 0·1416, and the observed deviation divided by its probable error equals 0·41, which brings the ratio well within the laws of probability.

False wild oats, either as steriloid, fatuoids, or their heterozygous counterparts, which occur frequently in our Australian varieties (4), should not be mistaken for natural crossbreds.

Another significant feature of anthesis in oats is the possible relation of the mechanics of anthesis to infection of the floral organs with loose or covered smut. According to Tapke (10), Fromme (6) has suggested "That apparent resistance in varieties may be due simply to escape of disease by virtue of a relatively cleistogamous habit of blooming, to an anthesis of shorter duration, or to both." Appel (1) too, asserts that certain barleys obtain their immunity from loose smut because of their closed flowers, and it is reported by Tapke also, that Brefeld and Falck (2) were successful in artificially infecting the flowers of a so-called cleistogamous variety of barley, that hitherto had shown immunity. In Tapke's paper he has shown that resistance in a certain variety of wheat could not be accounted for by a study of its mode of anthesis, but, as in oats, cleistogamy does not occur in wheat except under certain environmental conditions not conducive to the full opening of the glumes. Certain varieties, however, have a greater tendency than others to bloom with a wide separation of the flowering glume and palea.

In continuously cold wet weather, the opening of the glumes may be completely suppressed, as is often the case in England. As already stated cases where the glumes were only partially opened were noted on cold unfavourable days at Cowra last season. It is reasonable to suppose that in certain seasons when weather conditions so militate against normal flowering that anthesis proceeds without the wide gaping apart of the floral bracts, and that for such seasons no natural crossing may be reported; on the other hand, some seasons are particularly favourable for anthesis, and many of the exceptional cases, in which a series of abnormal events happen in occasional flowers, may occur, thus increasing the chances of natural crossing in such seasons.

The Sequence of Flowering.

The process of anthesis commences, without exception, in the panicle of the main axis, the panicles of the other axes beginning to flower in the same sequence as their emergence, and consequently in the order of their development. From a great number of observations made, no exceptions to this order were observed in plants of normal growth.

The following data refer to a single plant of Sunrise oats, taken as representative of the average where three panicles matured :—

	Panicle of main axis.	Panicle of second axis.	Panicle of third axis.
Date of emergence	25-9-29	27-9-29	29-9-29
Date of initial flowering	1-10-29	3-10-29	10-10-29
Date of completion of flowering ...	12-10-29	13-10-29	15-10-29

From this and many supporting observations, evidence of the following general rules was given :—

(1) Anthesis in the panicle of the main axis is more prolonged than that of the panicles of axes of lower order, the periods taken for the latter being successively shorter.

(2) A single panicle to complete flowering, occupies from one week to ten days.

(3) The period of anthesis for the whole plant occupies about two weeks. The order of flowering of spikelets on individual panicles also follows a systematic course definitely correlated with the order of spikelet development. Invariably anthesis is ushered in by the flowering of the primary or lower flower of the terminal spikelet of the panicle, either alone or accompanied by one or two other spikelets of next highest developmental order. Generally speaking, it is the rule, however, for the terminal spikelet to flower the day before flowering becomes general. This fact serves as a useful guide in hybridisation work, for by choosing a panicle for emasculation upon which only the terminal spikelet is about to flower or has flowered (in the latter case it should be removed) mature flowers of spikelets situated just below can be emasculated twenty-four hours prior to the day on which they would normally flower, and receptive stigmas in this way can be assured.

Flowering follows in the spikelets situated below the terminal spikelet of the panicle in a schematic fashion, again following developmental phases. Terminal spikelets of the panicle branches in all cases begin the flowering of the successive nodal groups. For this reason spikelets to be dealt with in hybridisation work should only be chosen from the extremities of the higher nodal branches; these spikelets situated near the main axis of the inflorescence, particularly those emanating from the regions of the main-branch axils, flower some days after the terminal spikelets of the branches of a lower nodal group.

Similarly a regularity exists in the flowering of component florets of the individual spikelets; the first to bloom is the primary or lowest placed floret, followed by the second and a possibly fertile third. Often two florets, and very occasionally all three, flower simultaneously; such a phenomenon is by no means general, but cases do occur on days particularly favourable to flowering that have been preceded by days distinctly unfavourable.

It would be misleading to set down any definite times required for the separate components of the inflorescence to flower. The vagaries of the weather, the variety, and the relative maturity of varieties cause much variation, and make it very difficult to give a generally applicable interpretation of the differences in times which lie between the pollination of individual flowers of a spikelet, spikelets as a whole, panicle branches, and complete panicles of a plant. Zade notes the extent of such variation, and this he states may be gauged from the fact that half a minute to one minute, or even one and a half days, may elapse between the flowering of the first and second flower of a single spikelet.

By way of illustrating the foregoing remarks on the order of flowering within the panicle, a particular case may be cited with advantage. On the

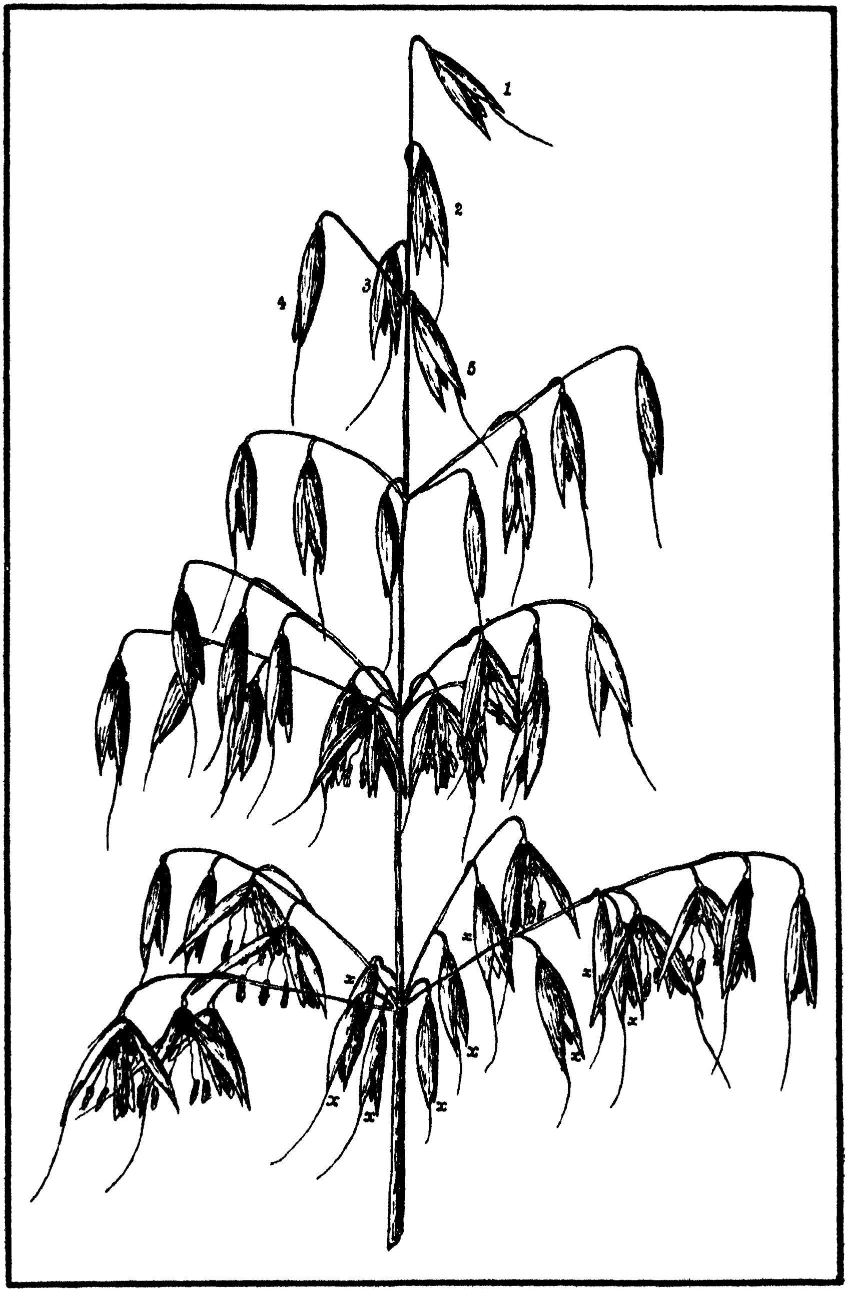

Diagram to Illustrate the Flowering of a Typical Panicle of Sunrise Oats.

Spikelet 1 was the first to flower (30th September, 1929); 2, 3, 4 and 5 flowered on the following day.
Spikelets with florets flowering represent the anthesis of the panicle on 10th October, 1929.
Those marked x have yet to flower.

30th September, 1929, the conditions were warm and humid, and indeed very favourable for anthesis; on this date the lowest floret of the terminal spikelet of the panicle under study flowered. The day following, that is on 1st October, 1929, the second florets of the terminal spikelet blossomed, together with the primary florets of the spikelets, 2, 3, 4 and 5 of the accompanying diagram. Conditions on 2nd October were distinctly unfavourable with cold winds blowing; practically no flowering was noted anywhere in the plots. On 3rd October, however, the air was still, fairly humid and warm, with the result that flowering in the afternoon was very vigorous, and the accompanying diagram illustrates the blossoming that occurred that day, on the panicle under study, between 3 p.m. and 6 p.m. Anthesis progressed throughout the panicle, intensity of flowering following the vicissitudes of the weather. The diagram illustrates the blossoming on the panicle on 10th October, two days before flowering of all florets on the panicle was completed.

It seems hardly necessary to mention that under circumstances of irregular ripening or abnormal growth, considerable fluctuation in anthesis may occur. Zade states that early ripening varieties usually finish flowering rather sooner than late ripening varieties; these differences, however, are not always perceptible, and it is possible that plants of early and late ripening varieties growing side by side will show no variation, particularly when a delay in flowering due to unfavourable conditions is followed by rapid anthesis occasioned by a sudden change to favourable weather. Under such circumstances the end of the process of flowering of both a late and an early variety may coincide. This is more often true in cooler oat-growing regions, but is not generally the case under Australian conditions, unless of course one or other of the varietal groups has been sown out of season.

European workers have found that on the whole the flowering period is comparatively shorter if, during the emergence of the inflorescence, growth is checked by the prevalence of low temperatures, and this is followed by a sudden warmth; that is, once the flowering organs are fully formed and only warmth is lacking to bring about anthesis, climatic conditions having caused a temporary check, the process of flowering sets in vigorously as soon as the last limiting factor is out of the way.

It has been intimated above that a knowledge of the sequence of flowering may act as a very useful guide when choosing flowers for emasculation. The essential of success in oat hybridisation is based on the stigma-branches of the flower being receptive at the time of pollination, and if the above knowledge is strictly applied the percentage of successful oat crosses will be much higher than if it is neglected. Further, in collecting pollen for pollination the above facts in connection with the order of flowering will save the investigator both time and trouble in securing ripe anthers that readily dehisce when desired during manipulation.

Summary and Conclusions.

(1) Accounts of anthesis in oats written by the German author Zade and the French authors Denaiffe and Sirodot are taken as a comparative background for an account of the process from the Australian standpoint. Those features of the discussion that apply to Australian conditions, together with many of the significant relationships of the process, have been built round in such a way as to supplement the original framework set down by the continental authors.

(2) The process of flowering is influenced by three main factors—(*a*) the time of the day, (*b*) the temperature, and (*c*) the humidity of the atmosphere.

Opportunity is here afforded to lay particular emphasis upon the first of these, that is the time of day. Afternoon pollination is a feature of oats, whereas in wheat or barley anthesis takes place in the morning. If this character of the oat plant is allowed to go unobserved, and there is every reason to believe that it has been in the past by some Australian cereal breeders, the tedious labour of hybridisation may be fraught with comparative, if not complete, failure. In other words, proceeding with artificial oat pollination in the mornings, similar to the times when successful wheat pollinations are achieved, reduces the possibilities of success to a minimum. The best time for pollination under our conditions is just prior to the time when flowering sets in, that is, from 2 p.m. to 3 p.m. At this time ripe anthers are readily obtained, stigmas are receptive, and there is not the same danger of foreign pollen entering during manipulation of the flowers as there is if pollination is left until later.

Temperature and the humidity of the atmosphere are also important factors influencing flowering. Ideal conditions prevail when the air is warm and laden with moisture. Excessive heat or cold have a retarding or checking influence.

The opening of the glumes, the spreading of the stigmatic-branches, and the elongation of the stamen filaments followed by anther dehiscence are all described in detail, together with the significance of each part of the process in relation to the probability and possibilities of natural crossing. Exceptional cases are noted and it is stipulated that flowering is not always schematic but may vary according to abnormal behaviour of one or all of the flower parts concerned in anthesis.

Two cases of natural crossbreds, thought to be between Algerian and the wild oat, *Avena fatua*, are cited.

Attention is drawn to the possible relation of the mechanics of anthesis to infection of the floral organs with loose or covered smut.

(3) The sequence of flowering is shown to follow, without exception, the phases of panicle, spikelet, and flower development. The importance of the oat breeder knowing the sequence of flowering of spikelets is duly emphasised.

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The order of flowering is traced and figured in a particular panicle of Sunrise oats, which was taken as representative and characteristic of the process.

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EARLY-SOWN OAT TRIALS AT COWRA EXPERIMENT FARM.

TRIALS to determine the most suitable varieties of oats for both hay and grain were continued last season at Cowra Experiment Farm.

The grain section of the trial was sown on 15th May and harvested on 22nd November. The yields of the early-sown grain oats were as follows, the figures in parentheses being the percentage average yield as compared with the standard variety for whatever number of years the variety has been under trial:—Algerian 39 bush. 30 lb. (100 per cent.—standard), Belar 39 bush. 20 lb. (96 per cent.), Guyra 37 bush. 10 lb. (83 per cent.), Weston 37 bush. (93 per cent.), Advocate 28 bush. 5 lb. (71 per cent.), Bombo 23 bush. 25 lb. (91 per cent.), Lampton 21 bush. 15 lb. (54 per cent.).

In the early-sown hay section, sowing took place on 15th May, using 57 lb. seed and 63 lb. superphosphate per acre. The plots were harvested on 11th November, and the yields were as follows:—Guyra 3 tons 8 cwt. 1 qr. (99 per cent.), Algerian 3 tons 8 cwt. (100 per cent.—standard), Weston 2 tons 19 cwt. (87 per cent.), Bombo 2 tons 15 cwt. (81 per cent.), Advocate 2 tons 9 cwt. (72 per cent.).

The soil on which these trials were sown is a heavy red granitic loam. It was mouldboard ploughed on 26th April, 1930, springtoothed on 7th May, and harrowed two days later.

Onion Experiments, 1930.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

A SERIES of onion trials was conducted during the past season with the object of further testing out new and standard varieties, while manurial trials were carried out to check up previous results and to gather further information as to the most profitable fertilisers to use with this crop. The coastal experiments, unfortunately, were destroyed by flood or by onion mildew.

The season generally was not a good one for onion-growing on the recognised onion grounds. Good rains were experienced in all districts, but this does not necessarily mean good onion weather. Constant rains and heavy dews, particularly on the heavier river soils, encourage the development and spread of onion mildew and prolong the growing season of most varieties. Observations have shown that onion mildew may cause the plants to run to seed, or prevent them from bulbing if the weather continues wet, or if there is heavy weed growth mildew will cause the bulbs to decay. Crop rotation, clean cultivation, correct irrigation methods, and the growing of disease-resistant varieties will overcome this trouble.

Early Barletta Onions from Locally-raised Seed.

The Varieties Tried.

New South Wales onion growers require three types of onions at present, and will perhaps want a fourth type when the industry is better established. The three required at present are:—(1) A very early-maturing variety, preferably a white skin; (2) a heavy-yielding early-maturing brown skin; and (3) a heavy-yielding early-maturing white globe. All growers in the early portion of the State endeavour to grow a few of the first type. Many varieties have been tested out by the Department with only partial success.

The standard variety used in commercial areas is the Early Barletta or Victorian White, while a few growers still stick to Chinese White. So much variation has been found in all these varieties that it was concluded that the individual selection of seed was of more importance than variety. In the case of Chinese White as many as 30 per cent. of brown bulbs were found in the various strains.

Lord Howe Island, perhaps our oldest variety, is superior in yield to all the previously mentioned varieties, is particularly mild in flavour and is readily sold when known. Unfortunately this variety is a deep purple colour and leads one to think that the flavour is very hot.

Some growers tried Hunter River White in this group. This variety is not a first-early type, but belongs to the Hunter River Brown group Any of the members of this group run to seed it planted before April, as many growers have found. Maitland White, a selection made by the writer, is also of the Hunter River group and is at least three weeks earlier than Hunter River White. It has the same defect of running to seed if planted too early and is not as heavy a yielder as Hunter River White. White Wax, an imported variety of very high quality, was also tried in this very early-maturing group, but like most importations did not compare in yield with local types. Early White Queen, a Victorian variety, very similar in variety characteristics to Early Barletta, proved this season to be a heavier yielder and superior type to the other flat whites under test.

The past season's and previous season's trials have proved that no variety yet to come under notice can compare with the Hunter River Brown Spanish to fit into the second group. Many strains have been tested, and all have proved to be good. The variety now known as McKimm was a Hunter River Brown Spanish selection, but owing to its many distinguishing features had to be renamed. McKimm matures at least two weeks earlier than the next earliest strain, is a deeper, more oblong shape than the standard type, has a characteristic medium dark-brown skin, and owing to its shape can be planted closer than most varieties. The Rowcliff strain of Hunter River Brown Spanish has yielded well, particularly under irrigation, and appears to be more uniform than most types. Mr. Redgrove's strain is well known as a consistent yielder under all conditions. All three strains are recommended to give satisfaction under all New South Wales conditions for the early brown market.

A heavy-yielding, early-maturing white globe onion always finds a good market in this State at all times of the year. The variety that fills the bill for this type is Hunter River White. Besides being an excellent yielding type this variety is of perfect globe shape and an excellent keeper. South Port White Globe has been tried, but was far too light in yield and late in maturing for New South Wales conditions. Maitland White will prove to be useful as a white globe type.

Tasmania, Victoria, and foreign countries have supplied this State with the majority of its onion requirements for the greatest part of the year, but the time is fast approaching when this State will supply onions to the home market all the year round; at present growers only cater for the early markets. Growers will then need to concentrate on a good-keeping type. Long-keeping Brown Spanish is an excellent keeping type, but only a moderate yielder under local conditions Strains of long-keeping types will be tested by the Department to ascertain the best types.

Details of the Variety Trials.

Of all the trials conducted by the Department during the past year the one carried out in co-operation with Mr Chater at Gilgandra was the most interesting This grower worked to perfection a piece of alluvial country that had not previously been cropped. The seed was planted on 1st April, and the seedlings transplanted during July under ideal conditions No fertiliser was used with the crop which was lifted on 11th November. Lord Howe Island proved to be the earliest maturing and heaviest yielding variety. Practically every bulb reached perfection and the crop was very uniform in type. Unfortunately this variety is a very poor keeper and is not very attractive. The McKimm strain proved to be the best of the Hunter River group, yielding over 19 tons per acre. Mr. Chater's trials have proved that the country along the Castlereagh is just as good as that on the Macquarie for onion-growing and will help to prove that we have more than sufficient land in this State on which to produce our onion requirements.

Portion of a 4-acre Crop, every Seedling of which was Transplanted.

Mr. Rowcliff, of Dubbo, tested out a great number of varieties of onions on lighter loamy country off the river with good results. The season suited this type of soil, Mr. Rowcliff finding it unnecessary to irrigate in order to get heavy yields. All the Hunter River Brown Spanish types produced well above expectations. An old variety, Early Golden Globe, yielded very well. Odourless has only been recognised as an amateur gardener's variety and may be of some value for this purpose, but for some years unsuccessful attempts have been made to keep bulbs of this variety over the summer for seed production. Two seasons ago bulbs were successfully carried over and seed produced. The seed was used in last year's trials with the results shown, which are not too encouraging.

Mr. Sunderland's trials were quite up to standard as usual. The outstanding feature of these trials was the results of good fallowing methods. This grower planted four acres (all transplanted seedlings) on land that had be well fallowed for nearly twelve months. The result was that weeding was cut down to a minimum and there was little loss from onion mildew. The planning of irrigation drains, check banks, and sub-irrigation channels, has been very skilfully done. The best use is made of the available land; planting, irrigation and cultivation can all be carried out with the great rapidity, and actually less work is involved in working this experimenter's onion bed than many only half the size.

Mr. Stan Gordon specialises in the early white flat onion, with good success. The land is heavy alluvial flat that is very subject to mildew. All varieties in the trial were infected with the disease, but the results show that the brown types yield well even under these unfavourable conditions. Mr. Gordon has good selections producing seed of the Early Barletta variety on his property, and hopes to be able to show a marked improvement over the present type when his own types come into cultivation next season.

Mr. E. Offner's plots were on light river country and produced results very comparable with those of Mr. C. J. Rowcliff. The bulbs were all of excellent quality.

ONION Variety Trials.

Variety.	A. Chater, Gilgandra.	T. W. Sunderland, Dubbo.	S. Gordon, Dubbo.	C. J. Rowcliff, Dubbo.	E. Offner, Dubbo.
	t. cwt. lb.	t. cwt. lb.	t. cwt. lb.	t. cwt. lb.	t. cwt. lb
Lord Howe Island	25 11 68	13 2 76	....	13 18 64	....
McKimm	19 8 0	13 2 76	10 10 8	16 12 16	11 5 64
Hunter River White	17 13 64	10 0 74	7 16 84	15 10 80	9 11 76
Hunter River Brown Spanish (S. Redgrove)	16 1 48	10 3 40	9 9 0	21 8 64	12 16 77
Hunter River Brown Spanish (C.J. Rowcliff)	15 5 40	10 3 40	11 1 56	16 12 16	11 7 102
Chinese White	15 8 4	....	....	15 10 80	....
Victorian White	11 2 36	....	....	15 0 0	....
Long-keeping Brown Spanish ..	9 13 84	....	....	....	....
Early Barletta	....	....	7 16 84	12 1 8	....
White Wax	....	....	7 0 28	....	....
Early White Queen	....	....	....	17 2 96	....
Early Golden Globe	....	....	....	15 10 80	9 15 64
Brown Spanish (Hobb's Selection)	....	....	....	13 7 96	....
Odourless	....	....	....	18 7 96	....
Maitland White	....	....	....	13 18 64	....

A Manurial Trial.

Trials conducted with farmers have proved in a very conclusive manner that fertilising onions pays under all conditions. All progressive growers make it a regular practice to fertilise; in some cases, however, too heavy an application is made to be justified by the advantages gained.

The results of all the trials carried out to date show basic superphosphate and M 22 to be the best payable fertilisers to use.

This year's results again favoured the application of M 22 and basic superphosphate at the lower rate (*i.e.*, on the basis of 420lb. of superphosphate per acre). A decrease in yield was found to result from the application of nitrogen or potash in conjunction with superphosphate.

RESULTS of Fertiliser Trial on Mr. W. T. Sunderland's Property.

Fertiliser per acre.	Yield		
	tons.	cwt.	qrs.
M 22, 420 lb.	16	17	2
Basic superphosphate, 525 lb.	16	17	2
Superphosphate, 420 lb.	15	6	2
No manure	14	18	2
P 11, 490 lb.	13	15	0
P 13, 60 lb.	13	11	0
Basic superphosphate, 1,050 lb.	15	6	2
Superphosphate, 840 lb.	11	19	2
P 11, 980 lb.	14	6	2
P 13, 1,120 lb.	16	17	2
No manure (check)	14	18	2

NOTE.—M 22 fertiliser mixture contains equal parts of superphosphate and bone dust, P 11 contains 6 parts superphosphate and 1 part sulphate of ammonia; and P 13 contains 6 parts superphosphate, 1 part sulphate of ammonia, and 1 part sulphate of potash.

Doubling the applications of fertiliser is an expensive procedure and resulted in decreased yields in all cases except in the case of P 11 and P 13. These increases appear to indicate that the nitrogen and potash were in too small amounts in the lighter applications. The increase in the case of P 13 was very substantial, being 3 tons 6 cwt. 2 qr. per acre. The total yield, however, was only equal to that produced by the light applications of M 22 and basic superphosphate and is therefore not a payable proposition. P 13 is a complete manure.

The only difference seen over a number of years as the result of the application of nitrogen is that it retards the maturity of the crop and has a tendency to produce "bull necks." Potash usually depresses the yield without any visible effect on the growth and quality of the plant.

WRITE to the Department of Agriculture, Box 36A, G.P.O., Sydney, for a copy of the illustrated leaflet, describing how to construct a crow trap.

The Papaw or Papaya.

(*Carica papaya.*)

G. B. BARNETT, Fruit Inspector, Grafton.

The papaw, or papaya, although a typical tropical plant, grows well on the Upper North Coast of New South Wales. It thrives best and produces good quality fruit on our scrub soils, but very satisfactory yields are obtained on the many other types of soil on which bananas are grown, provided the drainage is good (this is essential) and protection is afforded from frosts and winds.

Under favourable conditions the plant may mature its fruit within twelve months from planting. As far south as Coff's Harbour the papaw has been recorded on several occasions as maturing fruit of excellent quality during its eighth month. The average productive life of the plant is about four years, much depending on soil, location, and rainfall.

Male and Female Plants.

According to Popenoe* the papaw is normally diœcious, *i.e.*, with the staminate and pistillate (male and female) flowers produced on different plants. In addition to the staminate and pistillate forms, intermediate forms have been observed in which both sexes are combined in one plant. Staminate flowers may occur with rudimentary stigmas and ovaries which give rise to small worthless fruits, and there is a hermaphrodite type, which regularly produces perfect flowers, is self-pollinated, and yields excellent fruits.

Many and varied are the suggestions that have been expounded concerning the determination of sex, but the writer has yet to be convinced by any of these so-called "positive tests," except that the most vigorous plants usually grow up to be males. On account of the uncertainty of determination of the sex when setting out the plants many growers prefer to sow the seed in the land where the plant is intended to remain. This is the common practice among banana growers who grow papaws as a sideline, and certainly is to be recommended as the best method of propagation, as the plants do not receive the setback occasioned by transplanting.

Methods of Planting.

The usual practice in the banana plantation is to spread the seeds of a fresh, fair-sized, good quality fruit in rows or circles between the banana stools and then cover them with a light layer of soil. Thinning out of the plants is made when they are big enough to determine the sex. To every ten to twelve female, or pistillate, plants retain one male, or staminate, plant.

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* Manual of Tropical and Sub-tropical Fruits, by Wilson Popenoe.

The Papaw.

[Queensland Govt. Printer photo.

Where the seed is planted in boxes or beds, procure seed as fresh as possible from fruit of good size and quality and free from disease and plant it in the early spring in prepared soil, covering the seed to a depth of 1 inch. Keep the beds or boxes partially shaded during the early propagation period, and maintain the soil in a slightly moist condition. As the plants develop above ground allow them more sunlight in order to harden them off, and when about a foot high they should be ready for planting out. Avoid the hot midday sun when transplanting. Just prior to planting out give the plants a liberal watering in order to loosen the soil and allow of their being removed with a minimum amount of damage to the roots. The older leaves should be nipped off when the plants are being put out, allowing the leaf-stalk to remain. The plants should be spaced about 6 to 8 feet apart, and, if in rows, about 10 feet should be allowed between the rows.

When to Pick the Fruit.

Great care is necessary in harvesting and packing for market, as the fruit is very easily marked and bruised. The longer the fruit is allowed to hang on the tree the better is the quality and flavour, but after reaching a certain stage of maturity its carrying qualities are impaired. The proper stage of maturity at which to harvest depends on the nearness of the market, but the North Coast grower will find that for the Sydney market the best stage at which to harvest the fruit is when the calyx end is changing to a yellow colour.

In packing, the case should be given a layer of either wood-wool, grass, or crumpled paper on the bottom or top, while the fruit should be liberally wrapped with paper.

The papaw should be cut in half for eating, the seeds scraped out, and sugar, salt, orange or lemon juice applied to the flesh. This fruit is becoming increasingly popular in our cafes for serving with ice cream. The green fruit may be cooked and served as one would a vegetable marrow, or it can be used for making chutney.

YIELDS IN OAT GRAIN VARIETY TRIAL AT CONDOBOLIN.

THIS trial was sown on 17th April on a fairly moist firm seed bed, 49 lb. seed and 60 lb. superphosphate per acre being used. The yields were as follows, the figures in parentheses being the percentage average yield based on the yield of the standard variety for whatever number of years the variety has been under trial:—Mulga 42 bush. 18 lb. (100 per cent.—standard variety), Palestine 41 bush. 25 lb. (104.4 per cent.), Kelsall's 41 bush. 19 lb. (104 per cent.), Belar 39 bush. (101 per cent.), Karcela 38 bush. 1 lb. (80.5 per cent.), Buddah 35 bush. 16 lb. (78.9 per cent.), Gidgee 34 bush. 26 lb. (94.1 per cent.), Laggan 24 bush. 39 lb. (58.8 per cent.), Fulghum 23 bush. 19 lb. (70.8 per cent.), Kiah 18 bush. 9 lb. (64.5 per cent.).

Orchard Notes.

APRIL.

C. G. SAVAGE and W LE GAY BRERETON.

Cultivation.

WHERE a cover crop has not been sown for green manure it is an excellent plan to give the orchard an autumn ploughing. This practice is specially recommended for the drier inland districts where water is not available for irrigation. The plough is to be preferred to the cultivator as it puts the land in a more suitable condition to absorb and retain any rain that falls, while in addition the soil does not crust or set so readily after ploughing.

If it is intended to plant an additional area, it is wise to have it ploughed and subsoiled as early as possible, so as to allow the first good rains to soak in well, after which planting can be carried out when desired during the planting season On the other hand, if the land is left in an unbroken condition rain is not readily absorbed, and, should a dry winter follow, successful planting may not be possible

Sometimes the new land is soft enough to plough but not sufficiently soft to subsoil. In such cases it is advisable, first, to plough in order to allow the rains to soak in and soften the soil, after which it can be cross-ploughed and subsoiled.

Citrus Reminders.

The planting of citrus trees can be undertaken now in situations not liable to autumn frosts. Before planting, the trees should be examined and any weak or poorly rooted ones discarded Any broken or otherwise damaged roots should be cut away and the remaining roots placed in a clay puddle. Keep the trees that are to be planted rolled in a wet bag, as it is important that the roots should not be allowed to dry out.

The present comparatively slack period is a good time to carry out resoiling in citrus orchards.

Where scale insects on citrus trees have not been dealt with, fumigation can still be carried out. Leaflets on fumigation, red scale, and white louse are available from the Department of Agriculture, Box 36A, G.P.O., Sydney.

If shot-hole fungus has been prevalent on stone fruits, such as apricots, peaches, and cherries, the trees should be sprayed with Bordeaux mixture (6-4-22) just as the leaves start to fall. Leaflets on shot-hole of stone fruits and on the mixing of Bordeaux are also available from the Department.

Codling Moth.

It should always be borne in mind that it is the carry-over grubs from one season that are the sole cause of all the trouble in the following season. Because the end of the present apple and pear season is approaching, that is no reason why growers should relax in the fight against codling moth. On the contrary, it is very important that all infested fruit should be collected and destroyed at frequent intervals, otherwise the grubs will escape to sheltered positions where they may over-winter undiscovered.

When the last of the fruit has been picked from apple and pear trees, the bandages should be examined and all harbouring grubs killed. The bandages should then be replaced and left on until well into the winter, as sometimes grubs that have been sheltering elsewhere will make for the bandages long after all the fruit has been stripped from the trees

Clean Up the Packing Shed.

When the last of the crop has been despatched the packing shed should be given a thorough clean-up. All receptacles, cases, sacking, &c., that have been used for holding fruit should be dipped, if possible, by wholly submerging them in boiling water for three minutes Bins, benches, sizers, &c., that cannot be dipped should be thoroughly searched for any hiding codling grubs, special care being taken to probe all cracks, holes, or joints. Where canvas or sacking forms part of the packing equipment, hemmed, and frayed edges should be searched If the sacking is old it is best to replace it with new material and burn the old stuff

As an aid to moth control it is a great advantage to have all packing sheds and fruit stores so constructed that they can be made moth-tight. Then at the end of winter they can be closed and any moths emerging in the spring and early summer from imprisoned grubs can be destroyed as they are attracted to the windows by the light.

Advantages of Removing Loose Bark, &c.

The following observations by Mr. J. C. Allison, Orchardist at Wagga Experiment Farm, indicate the advantages of removing loose bark and plugging all holes and crevices in the trunks and main branches of trees in order to prevent codling grubs from sheltering therein.

During the month of September last and the early part of October, writes Mr. Alison, a systematic overhaul of the pear and apple trees in Block 1 of the experiment farm orchard was made All holes and crevices were cleaned out, all bark and broken limbs removed, and any places likely to afford harbour for codling grubs were blocked up with putty made of whiting and boiled linseed oil. During this work something like 350 grubs were destroyed, all of which were found harbouring in the main limbs above the crowns of the trees. That this work has proved highly beneficial the following figures show.

In the six examinations of bandages carried out between 1st December, 1928, and 1st February, 1929, the average number of grubs found in the bandages was 952. For the same number of examinations in the same period of 1929-30 the average was 574, and for the present season only ninety grubs were found during the same period and with the same number of examinations.

Mr. Allison points out that no spraying with arsenate of lead was undertaken in 1928 before the middle of December owing to the breakdown of the spray cart, so that an interesting comparison is afforded between the 952 grubs found in 1928-29 and the 574 found in the bandages in 1929-30 when a full spraying programme was carried out, and again between the 574 found in 1929-30 and the ninety discovered in the 1930-31 season when a full spraying programme, plus a thorough cleaning up and plugging of holes in the main limbs of the trees, was undertaken.

EARLY-SOWN WHEAT TRIAL AT CONDOBOLIN EXPERIMENT FARM, 1930.

THE early-sown section of the wheat grain variety trials at Condobolin Experiment Farm last season was sown on 15th April in a fairly moist seed bed, using 58 lb. seed and 60 lb. superphosphate per acre. The yields of these wheats were as follows, the figures in parentheses being the percentage average yield as compared with the standard variety Waratah for whatever period the variety has been under trial:—Bobin 30 bush. 29 lb. (111.6 per cent.), Nabawa 30 bush. 24 lb. (112.1 per cent.), Duri 29 bush. 18 lb. (106.9 per cent.), Waratah 28 bush. 30 lb. (100 per cent.—standard), Silver Baart 28 bush. 30 lb. (101.3 per cent.), Girral 28 bush. 18 lb. (102.3 per cent.), Bald Early 27 bush. (94.5 per cent.), Gluyas 26 bush. 36 lb. (99 per cent.), Garra 25 bush. 48 lb. (103.4 per cent.), Barootа Wonder 25 bush. 30 lb. (84.6 per cent.), Hard Federation 25 bush. 18 lb. (92.9 per cent.), Union 23 bush. 39 lb. (94 per cent.), Gallipoli 22 bush. 18 lb. (78.2 per cent.), Yandilla King 22 bush. 9 lb. (77.7 per cent.), Sepoy 21 bush. 48 lb. (76.4 per cent.), Nizam 19 bush. 39 lb. (86.7 per cent).

EARLY-SOWN WHEAT VARIETIES UNDER TRIAL AT TRANGIE.

SOWING in the case of the early-sown grain wheat variety trials at Trangie Experiment Farm was carried out on 12th April, using 58 lb. seed and 50 lb. superphosphate per acre. Germination was delayed until rain fell in mid-May and from then on throughout the winter the conditions favoured rapid, soft, and sappy growth. A very dry September greatly affected late maturing varieties such as Exquisite, Duchess, and Wandilla, the heads of these being caught in the flag. It can be definitely stated that late-maturing varieties, like Exquisite, are too late for the Trangie district. The early-maturing varieties were sufficiently far advanced to escape most of the dry spell and consequently yielded well.

The yields were as follows, the figures in parentheses being the percentage average yield as compared with the standard variety Hard Federation for whatever period the variety has been under trial:—Nabawa 31 bush. 35 lb. (120 per cent.), Baroota Wonder 31 bush. 30 lb. (119.6 per cent.), Dundee 28 bush. 45 lb. (109.2 per cent.), Burrill 28 bush. 5 lb. (106.6 per cent.), Baringa 27 bush. 55 lb. (106 per cent.), Ford 27 bush. 50 lb. (105.8 per cent.), Bredbo 27 bush. 35 lb. (104.7 per cent.), Hard Federation 26 bush. 20 lb. (100 per cent.—standard), Bena 25 bush. 45 lb. (97.4 per cent.), Federation 23 bush. 30 lb. (89.2 per cent.), Wandilla 19 bush. 50 lb. (75.3 per cent.), Union 18 bush. 35 lb. (70.5 per cent.), Duchess 16 bush. 25 lb. (62.3 per cent.), Exquisite 14 bush. 10 lb. (53.8 per cent.).

Poultry Notes.

APRIL.

E. HADLINGTON, Poultry Expert.

Select the Breeding Stock.

ON all farms where breeding work is carried out the month of April should see the breeding birds settled down in the pens ready for mating; the mistake should not be made of leaving this important matter till the last moment. The foundation of next season's pullets is laid when the breeding stock are selected, and no pains should be spared to see that the breeders are the best obtainable.

It is not sufficient that the birds should be the progeny of high-producing stock. This is only one factor, yet many poultry-farmers both here and in other countries place too much reliance upon it, without due regard to other vital points. Consequently disappointing results are obtained, and in many cases degeneracy is the outcome.

In the selection of breeding stock a hard and fast standard of physique should be decided upon and strictly adhered to. Without this essential good production cannot be maintained, nor can the size of eggs be kept up. Strong, healthy, rearable chickens cannot be produced from inferior birds. Attention should be focussed during the coming breeding season on improvement in any direction where weaknesses are apparent. We should not be satisfied that our birds are equal to anything in the leading countries of the world, because such an attitude will soon lead to inferiority. If we wish to maintain a high standard we must constantly strive for improvement.

Apart from type, which every breeder should endeavour to maintain, physique is one of the first considerations in choosing the breeding stock, and the weight of the birds should be checked before they are included in the breeding pen. In the case of Leghorns and other similar light breeds no birds should be used which do not come up to the following standards:—Cock 6 lb., hen 5 lb., cockerel 5 lb., pullet 4 lb. For the heavy breeds, such as Orpingtons, Langshans, Rhode Island Reds, &c., the weights should be:—Cock 8 lb., hen 6 lb., cockerel 7 lb., pullet 5 lb. In each case it is preferable that the birds be somewhat heavier, provided they are not excessively large and coarse.

Any birds showing signs of impurity, such as foreign-coloured feathers, &c., should be eliminated, also those having any deformities, or faulty combs with side sprigs. With the object of breeding for high egg production only those birds, both male and female, having large prominent eyes, fairly fine texture of comb, face free from wrinkles and undue feathering, and fine skull should be retained.

Single Matings.

The best results from every standpoint are obtained from single matings, *i.e.*, one male to ten females in the light breeds, and eight females in the heavy breeds.

No uniformity can be expected from large flocks, in which it is almost impossible to have a uniform type of bird. The aim, therefore, should be to have as many single matings as possible on every farm.

Day-old Chicks.

In these days, when the tendency is to purchase day-old chicks instead of going to the trouble of hatching, it is essential that those who cater for this trade should spare no effort to produce first-quality chickens. It is regretted that owing to the increasing number of hatcheries there is a tendency to reduce prices to a point at which good, sound chickens cannot be produced. This can have but one result, which is already apparent on some farms where cheap chickens have been purchased.

During my tour abroad I saw ample evidence of the evils resulting from the wholesale production of day-old chicks such as lack of physique, the prevalence of disease, and a high rate of mortality among not only the young stock, but also the adult birds. Heed should be taken of these danger signs, and if it is desired to purchase day-old chicks, due inquiry should be made to ensure, as far as possible, that they are produced from sound stock.

Co-operative Buying Associations.

With organisation and co-operation being talked of on every side, it is a matter for surprise that the poultry industry has not adopted the co-operative spirit to a greater extent. When it is considered that the feed consumption for the poultry in New South Wales amounts to some 4,000,000 bushels of wheat and maize and nearly 12,000,000 bushels of pollard and bran, there is surely much scope for co-operative buying, particularly in the more closely settled poultry districts. There are several well-established co-operative societies in the larger poultry farming centres which are doing good work for their members, and similar organisations could be formed in many other localities

One of the new food-buying societies is the Liverpool Poultry Farmers' Association, which has its store on the Hillview Soldiers' Settlement, and supplies foodstuffs to the settlers on that area and also to farmers outside the area. This association recently held its third annual meeting, and presented a satisfactory balance-sheet. One of the outstanding features of this association's operations is the low working costs, and members should be gratified at being able to secure their supplies with such small overhead charges. The main features of the balance-sheet are shown hereunder:—

(1) *Trading Account.*—A gross profit on trading for the year of £52 7s. 5d. is shown.

(2) *The General Revenue Account.*—The credit balance brought forward from 31st December, 1929, was £318 13s. 6d., to which has been added members' contributions for the year 1930 (£22 10s.) and £52 7s. 5d. gross profit transferred from trading account, making a total of £393 10s. 11d.

Against this amount certain expenses have been charged, totalling £46 10s. 5d., leaving a credit balance to be carried forward of £347 0s. 6d., as against £318 13s. 6d. for the previous year.

(3) *Balance-sheet.*—The total assets are shown as £474 6s. 3d., and liabilities £46 10s. 5d., leaving surplus funds to the credit of the association of £347 0s. 6d.

This association commenced operations in a modest way three years ago, and has gradually worked up a sound organisation. What has been possible in this small community of settlers could be emulated in many districts, and in times like the present poultry-farmers—like other primary producers—should do everything possible to reduce costs of production. There are hundreds of poultry-farmers in a small way who have to purchase their supplies in small quantities at much higher rates than they could be secured in truck lots, which results in an economic loss. With a little organisation every poultry-farming district of any size could establish a buying scheme and save hundreds of pounds a year in expenses.

Calcium Carbonate Requirements of Laying Hens.

During my recent visit to United States I observed an interesting experiment to ascertain the calcium carbonate requirements of laying hens which was being conducted by the Poultry Division of Cornell University, where 4,000 birds are run and mostly used for experiment work, though some stud birds are sold. A number of groups were fed different proportions of ground oyster shell, ranging from 2 per cent. to 8 per cent., while one pen was left without any at all. A check pen was given oyster shell grit instead of ground shell

The birds in the no-calcium carbonate pen were poor in health and condition, and laid only ninety-seven eggs. Those fed 2 per cent. laid 132 eggs and showed better condition, while those given 4 per cent. were in good condition and laid 165 eggs. The birds in the 8 per cent. pen were not so good in condition and laid 154 eggs, and those in the check (oyster shell) pen laid 168 eggs and were comparable in condition to those fed 4 per cent ; the quantity of shell consumed by the check pen was about equal to the 4 per cent. pen.

Battery Brooding.

At the New Jersey Agricultural College at New Brunswick much experiment work has been done with battery brooding over the past three years, trials being made with keeping the chickens in the brooders for different periods. The ten weeks period tried the first year proved unsatisfactory, and though the chickens did well for the six to seven weeks period tried in the second year, they contracted coccidiosis when put out, and owing to their lowered vitality half of them died. Last season the chickens were removed at four weeks and were placed in another type of brooder until they were seven weeks old; this treatment proved satisfactory.

Another test being carried out at this station was one to try out the effect of confinement of the birds from hatching to the end of the laying life, and of breeding from such birds. Though the trial has not been carried far enough for any definite conclusions to be drawn, the birds appeared pale and some were suffering from contagious bronchitis, roup, chicken-pox, &c. There was a distinct difference between them and several lots of 125 birds of the same age brought in by students and raised on free range. A system is in vogue at this college which allows a student to bring 125 pullets with him, and the returns from the birds (averaging about £2 per week over cost of feed) help to pay the student's college fees.

The Vineland Poultry Farms.

The Vineland district claims to be the leading poultry producing centre in U.S.A., and I was surprised at the similarity between the average type of poultry-farm in Vineland and those of Rydalmere and other large poultry centres in New South Wales, though the type of house is somewhat different, because of climatic conditions. The largest hatchery in the district has an incubator capacity of 400,000 eggs, the machines in use being seventeen 16,000-egg Buckeyes and several 100,000-capacity three-decker Newtowns. The hatching results were stated to be 65 per cent. of fertile eggs.

The number of layers on the farms visited ranged from 4,000 to 6,000 (all Leghorns), and the class of stock was much the same as on our farms The incubators and brooders in use were mostly types familiar to us, but one large farm had the Hall system of hot-water circulating brooders installed, which has the pipes underneath the floor, the heat coming up through a cylinder in the centre of the brooder.

On another farm two 15,000-egg Petersime incubators were installed, and the hatching results were stated as 80 per cent. fertile eggs. Room heated battery brooders are used on this farm, and the practice adopted is to take the pullets out at four weeks and leave the cockerels till broiler age. Colony brooders are used for the pullet chickens after they are taken out of the battery brooders, and they are kept in them up to ten weeks. The houses for layers are mostly large ones divided into several compartments with outside runs. Colony houses are in general use for rearing the growing stock, but they are of a low type, with roosts close to the ceilings and not far enough apart, while there was no ventilation over the birds. The poor health of the young stock was sufficient evidence of unsatisfactory conditions.

Most of the eggs produced in Vineland are picked up by carriers and taken 90 miles to New York, for which a charge of 1s. 0½d. per 30-dozen case is made. The cases chiefly used are, those which have been used once previously; they cost the farmer 12 cents each and are not returned. Poultry farmers complained that the industry was not paying owing to high costs of foodstuffs and low prices for eggs.

A DAIRY farm lay-out may be less sanitary for being more convenient, and vice versa. The separator room which abuts on the cow bails is an example of convenience procured at the expense, or at least the risk, of sanitation.

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1st *May*, 1931.

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VOL. XLII. PART 5. MAY 1, 1931.

Agricultural Gazette of New South Wales.

The Outlook for Wheat.

E. S. CLAYTON, H.D.A., Senior Experimentalist.

AUSTRALIAN wheat-farmers are at present confronted with grave difficulties, and have found it necessary to make momentous decisions which affect not only their own destinies, but also that of the State. To assist in determining their line of action, it is necessary that they be informed regarding the most important factors affecting world production, consumption, and price.

The price of wheat has fallen so low that at present wheat-growing is unprofitable in Australia on even the most efficiently managed farms. This is apparently also the case abroad, except where the local grower is protected on the home market. An analysis of the position indicates that by the very nature of its causes it is temporary, and prices will undoubtedly sooner or later recover from their extreme low point. Wheat-growing is by no means the only industry in Australia in a serious plight, almost all other primary and secondary industries, except those sheltered by embargoes and tariffs, are in like distress. In view of the world-wide business depression it would be strange if wheat-growing was profitable at the moment. But, apart from this general state of affairs, there are certain specific factors likely to prevent immediate recovery of wheat prices.

Fluctuation in World's Production.

Prior to the War there was a general upward tendency in world production of wheat. The trend was interrupted by the War, only to be continued on the cessation of hostilities. World production has risen from around 2,700 million bushels in 1900 to 4,700 million bushels in 1928. World consumption, while fairly constant, also shows an upward trend (it will be discussed later). The world's wheat crop of 1928 (4,700 million bushels) is the largest ever produced. The 1929 crop was 500 million bushels less, which represents a considerable fluctuation. The huge 1928 crop resulted in an extremely heavy carry-over of stocks, and the total available world supplies were heavier than ever before. The world was over-supplied with wheat in 1923-24, but the stocks position was not so acute. The larger crop of 1923 was followed by a short crop in 1924, but accumulated stocks were never very large because the 1923 crop was preceded by two years of short crops. In the present case, however, the 1929 crop was preceded by the record crop of 1928, which also followed on the fairly large crop of 1927. World's stocks at the beginning of 1924-25 were much lower than those at the beginning of the 1929-30 season.

In 1929 the yield was low in practically all the exporting countries. In Europe (excepting Russia), however, the yields per acre were high, especially in the importing countries. France and Italy harvested very heavy crops. The relatively small crop of 1929, and also the small crop of 1924, was chiefly due to a low yield per acre, although there was a big reduction in acreage relative to the preceding year. The 1929 yield per acre was the lowest for ten years in the Argentine and Australia. It was also strikingly low in U.S A., Canada, India, and Bulgaria. Drought was the general cause of the low yields, though rust was an important factor in the Argentine.

To illustrate further the fluctuation in production as a result of drought and disease, consider the small Canadian crop of 1929. A yield of only 305 million bushels was secured from the largest area ever sown (25.3 million acres). Then in 1928 Canada's production from a small area was the largest on record, due chiefly to an extraordinarily high yield per acre. The Russian crop in 1929 was approximately 703 million bushels, which appears to be the smallest harvest during the five years 1925 to 1929, but probably to have exceeded the crops of the early post-war years It was harvested from an area of 75.7 million acres, so that the yield per acre was 9.3 bushels, which ranks with the low Russian yields of 1924 and 1927, and is in marked contrast to the high average yield of 12.4 bushels in 1925 and 1926. The variation in total production which occurs in all the important wheat exporting countries is also reflected in the world's production. Although maintaining definite trends, it varies considerably from year to year.

WHEAT Production in Principal Producing Countries, 1920-1930.*

(Million bushels.)

Year	United States.	Canada	India	Australia	Argentine	Soviet Russia	France	Germany	Italy
1920	833·0	263·2	377·9	145·9	156·1	†	236·9	82·6	142·3
1921	814·9	300·9	250·4	129·1	191·0	†	232·5	107·8	194·1
1922	867·6	399·8	367·0	109·5	195·8	†	243·3	71·9	161·6
1923	797·4	474·2	372·4	125·0	247·8	419·1	275·6	106·4	224·8
1924	864·4	262·1	360·6	164·6	191·1	472·2	281·2	89·2	170·1
1925	676·8	395·5	331·0	114·5	191·1	782·3	330·3	118·2	240·8
1926	831·4	407·1	324·7	160·8	230·1	913·8	231·8	95·4	220·6
1927	878·4	479·7	335·0	118·2	282·3	776·0	276·1	120·5	195·8
1928	914·9	566·7	290·9	159·7	307·4	795·2	281·3	141·6	228·6
1929	809·2	304·5	320·7	126·5	137·4	702·9	319·9	123·1	260·8
1930	851·0	395·9	386·5	214·0	271·5	1,157·4	232·0	131·2	213·1
Average.									
1909 to 1913	690·1	197·1	351·8	90·5	147·1	‡758·3	325·6	131·3	184·4
1924 to 1928	833·2	422·2	328·4	143·6	240·4	747·5	280·1	113·0	211·2

* Data of U S.A. Department of Agriculture and International Institute of Agriculture For 1909–13, including U.S A. Department of Agriculture estimates for area within post-war boundaries.

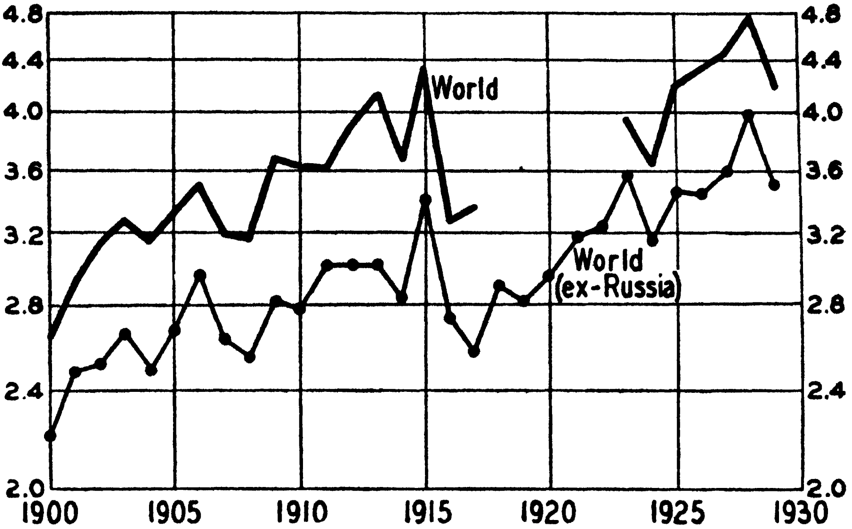
† Data are not available

‡ Regarded as too low by some Soviet officials, whose estimate is 908 million bushels.

The graph below illustrates the pre-war upward trend, the interruption during the war and the upward post-war trend. It also shows the yearly fluctuations in world production. The effect of this fluctuation on consumption, price, and acreage will be discussed later.

CHART 1.—WORLD WHEAT PRODUCTION, 1900–29*

(Billion bushels; logarithmic vertical scale)



*** Data of the U.S. Department of Agriculture as published in *Agricultural Yearbook, 1930*, p. 604; *Foreign Crops and Markets*, March 24, 1930, p. 432; and *World Wheat Prospects*, November 22, 1930, p. 3. "World" production figures do not include estimates of the wheat production of China, of some of the countries of Asia Minor, and of certain other small producers.**

World Consumption.

The world's demand for wheat, like the world's production, is increasing. World's demand increases with the growth of population in consuming countries, and the general world tendency towards the use of wheat instead of less desirable foodstuffs. The consumption of wheat in Russia, for example, has been so increased that, although Russia's wheat production during the past five years has equalled that of pre-war production, the exports have not been comparable.

In Eastern countries the consumption of wheat has been increasing rapidly. In Japan the per capita consumption of wheat products has increased from 0.52 to 0.76 bushels in thirty years. This, with her ever-growing population, has increased the total annual disappearance of wheat in Japan from 23 million bushels to more than 47 million bushels.†

The annual wheat consumption of tropical countries has increased from an average of 46 million bushels before the war to over 66 million bushels in recent years—an increase of over 30 per cent. During the period there has been a population increase in these countries of only 21 per cent. The increase in wheat consumption for these countries amounts to an improvement in the standard of living.

The human consumption of wheat is fairly constant in Canada, United States, Great Britain, and Australia, and, in fact, all countries with a high standard of living. In such countries the price of wheat has little effect on human consumption, but in other countries consumption varies with price.

In many European countries the food consumption of wheat varies with the supply of other grains and potatoes which are used as substitutes for wheat. In the United States when wheat prices are low in relation to maize prices a greater amount of wheat than normal is utilised for stock feeding. In spite of these factors, however, such a large proportion of the world's wheat crops is used for human food in those countries where demand does not alter greatly as a result of prices, that marked increases in production and stocks are sure to have the effect of depressing the prices.

Russia, Japan, and tropical countries are rapidly increasing their wheat consumption, but unfortunately consumption is not increasing as rapidly in most of the major consuming countries.

Europe (excepting Russia) consumes a very large part of the world's wheat. The population is increasing slowly, and there is also a tendency to shift from the use of rye and other foodstuffs to wheat. In some of the importing countries, however, this tendency is checked by higher duties on wheat. It is interesting to note that among the importing countries tariff duties on wheat were increased during 1929-30 in France, Italy, Germany, Austria, Greece, Poland, Finland, Mexico, South Africa, Egypt, and Turkey. By many and varied devices efforts were made to restrict wheat and flour imports in order to encourage home production, or to help in improving trade balances. During the war these countries had to have wheat, and they got supplies from whatever source was available. After the war they re-imposed duties, and latterly, as prices have declined, the duties have been greatly raised. These actions tend to reduce the world's total demand for wheat. Recently, assisted by the heavy European crops, these tariffs have been effective in restricting the amount of wheat imported into Europe. This has had the effect of increasing the world carry-over of wheat, consequently reducing the price on the world's market.

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† "Japan as a producer and importer of wheat." Wheat Studies of the Food Research Institute, Vol. 6, No. 8.

World Stocks.

Actually it is visible world's supplies rather than the crop of any one year that is so important in its effect on price. The accumulation of stocks is for this reason worthy of consideration.

The huge crop of 1928 resulted in a much heavier carry-over than usual, and at the beginning of the 1929-30 crop year the stocks of wheat in Europe (excepting Russia), United States, Canada, and Australia, were at the highest August level of post-war years. The 1929 world wheat crop was below requirements, and the accumulated stocks were in the aggregate reduced during the year. The reduction amounted to about 80 million bushels. The main reduction of stocks seems to have occurred in the Argentine, the Danube Basin, and the European importing countries, but not in Canada, United States, or Australia. In these countries stocks actually increased because of the tendency to hold wheat when prices are low, although, in the aggregate, world stocks were reduced, the net reduction was not large enough to bring the carry-over of 1929-30 to a normal post-war level. So great was the carry-over in July, 1930, that it was exceeded only by the huge stocks on hand at the end of July, 1929. The heavy carry-over continued to depress the market and the level and movement of wheat prices in 1929-30 may be explained by the magnitude of the visible supplies. The effect of these stocks was felt more in 1929-30 than in the previous year, when greater stocks were held without exerting their full price-depressing effect. In 1929-30, with increasing general business depression, the heavy accumulated stocks of wheat burdened the market and brought the price down. Wheat stocks may increase to such an extent that holders lose confidence and attempt to liquidate. No doubt this is what happened in 1929, but the price decline was interrupted by the unfavourable crop reports in Canada, Argentine, and Australia, but continued again early in 1930, and has persisted ever since.

Stocks in Chief Exporting Countries.

United States.—The total carry-over in the United States on 1st July, 1930, approximated 275 million bushels. This was the largest carry-over in post-war years. The tendency of both growers and speculators to hold stocks when prices are low is probably stronger here than in any other country, probably because of the excellence of the local market.

Canada.—Official estimates place the carry-over on 31st July, 1930, at 112 million bushels, which is about 8 million bushels larger than the previous record post-war carry-over of 1929. During the crop year 1929-30 stocks were increased. The Canadian pool and also private traders for a time held prices above export parity, consequently Canadian wheat exports were restricted, and European importing countries were largely supplied by the Argentine. In view of the fact that Canada greatly depends upon wheat exports, it is remarkable that outward stocks amounting to over one-third of the 1929 crop should have been accumulated. It is possibly explained by the American contention that Canadian sellers misjudged the world's wheat situation in the earlier period of the crop year, anticipating higher prices and heavier European importations than actually occurred.

The Argentine.—Approximately 70,000,000 bushels of wheat were held in the Argentine. This is a normal carry-over. Argentine exporters, generally weak holders, were willing to accept lower prices than those acceptable to exporters of other countries. They were somewhat pressing, and, being prepared to meet the market, kept the domestic price at world's parity, and succeeded in exporting 150,000,000 bushels in the crop year 1929-30. It almost appears that the holders of Canadian and American wheat made the market for the Argentine.

Australia.—The exports of wheat and flour in 1929-30 were about 63,000,000 bushels. This is the lowest figure for the past ten years, excepting 1922-23. Visible supplies on 1st August, 1930, were about 3,500,000 bushels, the largest record for eleven years. Changes of stock were not very large. Wheat appears to have been firmly held in Australia in the first half of 1930, possibly because conditions at this period were not at all favourable for the coming crop of 1930. However, the weather conditions improved later, and a heavy crop was eventually harvested.

Europe.—The meagre data available regarding European utilisation indicates that stocks were normal on 1st August, 1930, and that in the aggregate there was a reduction of stocks during the crop year 1929-30. Increases in stocks in France, Britain, Spain, Austria, and Poland were in all probability offset by decreases in Germany, Italy, Denmark, Greece, and Norway. European stocks were reduced by about 25,000,000 bushels (assuming as correct the statement that the French crop of 1929 was officially under-estimated by 30,000,000 bushels.* In the Danube basin stocks were reduced by about 35,000,000 bushels, and in 1930 were at a normal level.

Other Countries.—Very little is known of the exact stocks position in Russia, India, China, Japan, and Northern Africa.

World Crops in 1930.

The world wheat crop of 1930 (excepting Russia, Asia Minor, and China) was approximately 3,695,000,000 bushels, which, trend considered, is of normal size. It is about 215,000,000 bushels smaller than the tremendous crop of 1928, and about 235,000,000 bushels larger than the inadequate crop of 1929.

Russian production in 1930 is said to have been extremely large, but it is difficult to get accurate figures. The United States crop was above average size (it was estimated at 851,000,000 bushels), while an estimate places the Canadian at 396,000,000 bushels, which is about normal. European (excepting Russia) crops in 1930 were smaller than the 1928 out-turn by 50,000,000 bushels, and 100,000,000 bushels less than the 1929 crop; the reduction in yield, occurred in the importing countries. Crop reports indicate that Argentine obtained a fairly large crop and the Australian crop was very large.

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* "The World Wheat Situation." Wheat studies of the Food Research Institute Stanford University, Vol. VII, No. 2.

World's Price in 1930.

Prices touched very low levels in 1930. The export demand for United States and Canadian wheat was not as great as traders expected in view of low prices, and only temporary checks interrupted the downward trend of prices. Large Russian shipments coming as a surprise in September and October further depressed world prices. The general business depression, of course, also had its effect on wheat values.

During November, the world price moved slightly upward due to reports that Russian shipments had almost ceased, and that the Argentine crop had suffered permanent damage from rust, also the Canadian wheat pool was not expected to be forced into liquidation, as previously had been thought likely. At the end of November and in early December world prices were relatively firm. However, the price again declined in December, due chiefly to actual selling pressure and the expectation of future selling pressure from the crops being harvested in Australia and Argentine.

Reviewing the position, it is difficult to see any factor likely to cause a satisfactory increase in world's price within the next few months.* Argentine and Australia, during the period January to March, 1931, shipped large amounts of wheat. Australia, from 1st December, 1930, to 31st March, 1931, shipped 55,000,000 bushels of wheat and 156 tons of flour, equal to a total of 62,860,000 bushels of wheat. Canada's stocks position also is such that she can ship in large volume. As European wheat stocks are still rather large, it seems likely that selling pressure will be exerted by exporting countries on the international market.

It is also probable that the use of wheat will be extended on account of the low price. The Orient is this year taking a large quantity of Australian and some of the lower quality Canadian wheat. The Argentine also is likely to make large shipments to ex-European countries. The United States stocks have been reduced by heavy feeding of wheat to livestock. With these developments the stocks position will be greatly eased and selling pressure should be less in evidence towards the end of the year.

Many keen observers are said to be of the opinion that the trade cycle is at its lowest point and is likely to trend upwards in the next few months. Should this eventuate, inspiring confidence in holders of wheat stocks, prices would be likely to rise appreciably, even if the wheat supplies position remains unaltered, but it is certain that the crop prospects for 1931, unknown at present, will, as they become known, markedly influence the trend of prices in 1931.

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* "Survey of the World Wheat Position." Wheat Studies of the Food Research Institute, Stanford University, Vol. 7, No. 3, Jan., 1931.

Price of Wheat—Relation to Production.

World conditions of supply and demand determine the price of wheat. It has been estimated that, omitting the two seasons 1923-24 and 1929-30, when general business depression reduced the world's price of wheat below the normal trends, an increase, on an average, of 100,000,000 bushels in world's supply will reduce the world's price by about 4d. a bushel, and a reduction of 100,000,000 bushels will increase the price about 4d. a bushel.*

The situation regarding world's visible supplies seems to indicate that the stable prices obtaining in the 1928-29 crop year were, to a great extent, the result of a spirit of optimism. In spite of the evidence that the 1928 crop was the largest on record, wheat prices remained stable. During this period general business conditions were very favourable and this no doubt was reflected in the buoyancy of the wheat market. In 1929-30, however, the general business position was entirely different and was perhaps responsible for the exceptionally weak holding (in some countries) of wheat during this period. Prices were much lower than the previous year in spite of the fact that world visible supplies were actually lower.

Future Wheat Prospects.

It appears strikingly clear that competition will be particularly keen in the future. In all probability the tendency of the great exporting countries towards extension of area will be checked, but a formidable area will no doubt still be sown to wheat. The depressing effect of the world's huge surplus, intensified by a world-wide general business depression, must continue to affect prices adversely until one or the other improves. The huge surplus can be brought closer to the normal carry-over by short world's crops—always a possibility in spite of large acreage. Reduction in the world's area sown to wheat would soon restore a healthier tone to the market, but voluntary reduction by agreement does not seem likely of achievement. In fact, it would be most unwise for Australia or Canada voluntarily to cut down wheat acreage, as it would only benefit Russian growers who would be almost certain to make up any reduction in area. In all probability the keenness of the competition may force many growers out of production, especially those who are not producing economically. It could also be reduced by greater consumption stimulated by low prices, especially in Eastern countries. Unfortunately, however, rapid changes in food habits in the East are difficult to achieve, even when prices are particularly favourable to the change, as they certainly are at present.

In those portions of the great exporting countries, Australia included, where soil and climate permits of a change to other more profitable forms of farming, there is every likelihood of wheat acreage being reduced. However, wheat is one of the hardiest plants in cultivation, and most of the areas on which it is grown in exporting countries are climatically unsuited to the profitable production of other crops, consequently growers in these areas are practically forced to grow wheat and must adopt every device to increase efficiency of production in their struggle for existence. No doubt a very high state of efficiency has been achieved by American growers on the great inland plains where the nature of the country favours the cropping of extensive individual areas and the full use of large up-to-date machinery.

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* "The World Wheat Outlook, 1930." United States Dept. of Agriculture.

Low prices would certainly operate against a general extension of area, but on the typical "dry farming" wheat areas of the world where growers are already committed to wheat production and cannot switch over, their only chance of making a living in the face of low prices is to grow as much wheat at as low a cost as possible. This is true of the dry areas of all the great exporting countries, including United States, Canada, Argentine, Russia, and Australia, so that, although low prices should somewhat reduce world areas in the aggregate, the reduction would be chiefly in climatically favoured districts, and it would be unduly optimistic to expect low prices to effect an immediate improvement of the position.

There is, however, one phase of the wheat situation which offers some hope and is worthy of discussion. As pointed out in the paragraph on fluctuation in production, the world's wheat crops vary considerably from year to year, sometimes falling well below requirements, and were it not for the carry-over of stocks from year to year a grave shortage would periodically occur. The main reason for this yearly fluctuation is the variation in yield per acre rather than variation in acreage. In 1928 Canada harvested 567,000,000 bushels from 24,000,000 acres, whereas in 1929 only 294,000,000 bushels was harvested from 25,000,000 acres. Argentine in 1929 sowed almost as large an area as in 1928, yet she harvested less than half as much wheat In United States the 1929 crop, although taken from a larger area, was 108,000,000 bushels less than that of 1928. The significance of these figures cannot be overlooked. It may even be said of wheat production that the only certainty about it is its uncertainty. In recent years in all the important exporting countries wheat-growing has been extended into very dry areas where the rainfall is low and variable, and the bulk of the export wheat comes from such areas.

Drought and disease continually threaten the crops in the dry portions of United States, Canada, Argentine, Russia, and Australia. Even without reduction of world acreage, short world crops may at any time reduce the huge visible supplies of wheat. This appears to be the main hope of improving the world's wheat market.

Some improvement can be looked for in the European demand for wheat. European countries recently have been favoured in their determination to restrict wheat imports by the heavy local crops, the result of favourable weather, but they may not continue to be so favoured in the immediate future.

The Situation in Russia, &c.

In the second half of this article, which will appear in next month's issue of this *Gazette*, the situation in Russia will be dealt with and suggestions will be made as to how Australian wheat-growers can best meet the intensified competition anticipated from wheat exporting countries in the future.

(*To be continued.*)

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36A, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Aussie	Manager, Experiment Farm, Trangie.
	J. Parslow, "Cooya," Balladoran.
Baroota Wonder	Manager, Experiment Farm, Temora.
Bobin	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Condobolin.
	W. W. Watson, "Woodbine," Tichborne
	E. J. Johnson, "Iona," Gunningbland.
	Manager, Experiment Farm, Cowra.
Bruce	L. R. Harton, "Ferndale," Werris Creek.
Canberra	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Condobolin.
	Freudenstein Bros., Post Office, Tyagong.
	W. W. Watson, "Woodbine," Tichborne.
	E. J. Johnson, "Iona," Gunningbland.
	F. Penfold, "Bluevale," Boggabri.
Canimbla	A. E. Dixon, "Bramshott," Wallendbeen.
	Manager, Experiment Farm, Cowra.
Clarendon	C. Anderson, Swan Vale Post Office, *via* Glen Innes.
	J. Parslow, "Cooya," Balladoran.
Cleveland	W. Burns, "Goongirwarrie," Carcoar.
Currawa	Manager, Experiment Farm, Temora.
Duri	Manager, Experiment Farm, Cowra.
Exquisite	P. Corcoran, "Weeroona," Moombooldool.
	Manager, Experiment Farm, Cowra.
Federation	Manager, Experiment Farm, Temora.
Firbank	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Condobolin.
Florence	**Manager, Experiment Farm, Trangie.**
Free Gallipoli	Manager, Experiment Farm, Temora.
Gluyas Early	Manager, Experiment Farm, Temora.
Gullen	**P. Corcoran, "Weeroona," Moombooldool.**
	Manager, Experiment Farm, Temora.
	W. G. Law, "Thistledown," Gilgandra.
Hard Federation	**Manager, Experiment Farm, Trangie.**
	L. R. Harton, "Ferndale," Werris Creek.
Improved Steinwedel	**Manager, Experiment Farm, Trangie.**
Marshall's No. 3	**B. J. Stocks, "Linden Hills," Cunningar.**

***Wheat*—continued.**

Nabawa	... Manager, Experiment Farm, Trangie. G. Hand, "Hill View" Narromine. P. Corcoran, "Weeroona," Moombooldool. Whitfield Bros., "Gamble," Binnaway. R. B. B. Gibbes, "Glenmore,"Old Grenfell Rd., Forbes. Manager, Experiment Farm, Condobolin. Manager, Wagga Experiment Farm, Bomen. Manager, Experiment Farm, Cowra. Manager, Experiment Farm, Temora. A. D. Dunkley, " Bon Lea," Brundah, Grenfell H. J. Harvey, " Kindalin," Dubbo. G. R. Lee, " Oakwood," Dubbo. W. G. Law, " Thistledown," Gilgandra. J. Parslow, " Cooya," Balladoran. R. Massingham, " Aylmerton," Binnaway. J. Berney, " Eurimbla," *via* Cumnock. A. P. Unger, " Stony Hill," Alectown. B. J. Stocks, " Linden Hills," Cunningar. R. G. Norris, " Morven," Coolah. E. Idiens, " Kangarooby," Goolagong. F. Penfold, " Bluevale," Boggabri. W. W. Watson, " Woodbine," Tichborne. J. P. Cullen, " Redbank," Dubbo. Quirk and Everett, " Narrawa," Wellington E. J. Johnson, " Iona," Gunningbland. E. Jones, "Iona," Narromine.
Ranee	... A. G. Manning, "Irriga," Ungarie.
Turvey	... W. W. Watson, " Woodbine," Tichborne.
Wandilla	... Whitfield Bros., " Gamble," Binnaway.
Waratah	... Manager, Experiment Farm, Trangie Manager, Experiment Farm, Cowra. Manager, Experiment Farm, Condobolin. T. W. Abberfield, "Wongo Creek," Alexander Park. G. Hand, "Hill View," Narromine. Manager, Experiment Farm, Temora. S. E. Nash, " Lockwood," *via* Canowindra. W. W. Watson, " Woodbine," Tichborne. E J. Johnson, " Iona," Gunningbland. A. E. Dixon, " Bramshott," Wallendbeen. B. J. Stocks, " Linden Hills," Cunningar. E. Idiens, " Kangarooby," Goolagong. F. Penfold, " Bluevale," Boggabri.
Yandilla King ...	... Whitfield Bros., "Gamble," Binnaway. Manager, Experiment Farm, Temora. A. E. Dixon, " Bramshott," Wallendbeen. S. E. Nash, "Lockwood," via Canowindra. B. J. Stocks, " Linden Hills," Cunningar. Manager, Experiment Farm, Cowra. J. Chamberlain, Box Flat, Marrar.

Oats—

Algerian	... Manager, Experiment Farm, Temora. C. Bennett, Forbes-road, Cowra. A. E. Dixon, " Bramshott," Wallendbeen. J. Pearce, Mandagery. H. E. Ward, " Gwenvale," Parkes. Manager, Experiment Farm, Cowra. E. D. Ogilvie, "Ilparran " Matheson, via Glen Innes.
Belar...	... Manager, Experiment Farm, Temora. Manager, Experiment Farm, Trangie. Manager, Experiment Farm, Cowra. D. H. Deering, "Kurralta," Piambra. H. E. Ward, "Gwenvale," Parkes.

Oats—continued.

Buddah	Manager, Experiment Farm, Trangie
	Manager, Experiment Farm, Cowra.
Gidgee	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
Guyra	H. R. King, "Mangay," Kingsvale.
	E. D. Ogilvie, "Ilparran," Matheson, via Glen Innes.
Lachlan	Manager, Experiment Farm, Temora.
	A. E. Dixon, "Bramshott," Wallendbeen.
	H. McFadyen, "Lochbine," West Wyalong.
Mulga	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Cowra.
	N. S. Meek, Hobby's Yards, *via* Newbridge.
	C. Bennett, Forbes-road, Cowra.
	H. E. Ward, "Gwenvale," Parkes.
	A. Head, "Springwood," Cookamidgera.
	D. H. Deering, "Kurralta," Piambra.
Sunrise	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
White Tartarian	E. D. Ogilvie, "Ilparran," Matheson, via Glen Innes.

Field Peas—

Black Eye	H. Garside, Dartbrook, Aberdeen.
Lucerne	W. J. Scott, "Allengrove," Baerami Creek.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

LATE-SOWN WHEAT TRIALS AT WAGGA EXPERIMENT FARM.

TRIALS to ascertain the best yielding late-sown wheats for the Wagga districts were again under trial last season at Wagga Experiment Farm. Sowing took place on 24th May with a drill, 62 lb. seed and 140 lb. superphosphate per acre being used. The yields were as follows, the figure in parentheses being the average percentage yield based on the yield of the standard variety Waratah for whatever number of years the variety has been under trial:—Bobin, 35 bus. 40 lb (113.3 per cent.); Duri, 35 bus. (115.3 per cent.); Gular, 34 bus 20 lb (105.8 per cent); Rajah, 33 bus. 40 lb. (120.9 per cent.); Bald Early, 31 bus. 50 lb. (103.2 per cent.); Waratah, 31 bus. (100 per cent, standard variety); Nabawa, 31 bus. (112.3 per cent.); Garra, 30 bus. 20 lb (97.3 per cent.); Geeralying, 29 bus. 40 lb. (99.6 per cent.); Aussie, 29 bus. 50 lb. (106.3 per cent.); Ranee, 27 bus. 20 lb. (92.1 per cent.); Canberra, 26 bus. 40 lb. (89.8 per cent.); Bogan, 26 bus. 10 lb. (97.3 per cent.); Sands, 24 bus. (95.2 per cent.); Barootа Wonder, 22 bus. 30 lb. (78.7 per cent.).

During the six years that Bobin has been under test it has outyielded Waratah by 3½ bushels per acre per year on the average, and has yielded approximately half a bushel per acre more than Nabawa. This last-named variety lacked density this season, but again showed high resistance to flag smut, thus indicating that it is a most suitable variety for use in a rotation with oats for the control of flag smut.

Wheat and Oat Trials, 1930.

FARMERS' EXPERIMENT PLOTS.

Riverina District.

G. C. BARTLETT, H.D.A., Senior Agricultural Instructor.

VARIETY, manurial and rate of seeding trials with wheat, and variety and manurial trials with oats were conducted on farmers' experiment plots last season.

The Season.

The general climatic conditions in this district were discussed on page 193 of the March issue in connection with the wheat crop-growing competition. Rainfall for the fallow and growing periods for various centres is given in the accompanying table.

Cultural Details.

Gerogery (C. W. Moll).—Soil, red loam, undulating; very old land; wheat 1928; mouldboard ploughed 4½ inches July, 1929, harrowed end August, scarified end September, January and again before sowing with a hoe drill 1st and 12th May, seed 70 lb (Marshall's No. 3 and Yandilla King 60 lb.), superphosphate 112 lb per acre.

Jindera (G. Nation).—Soil, brown loam, undulating; very old land; oats 1928; mouldboard ploughed 4½ inches in August, 1929, harrowed October, scarified January, March and April; combine sown 1st and 13th May, wheat 65 lb. seed and 90 lb. superphosphate per acre, oats 60 lb. seed and 84 lb. superphosphate per acre.

Walla (H. McCrum).—Soil, brown loam, billabong country, flat and silty; very old land; wheat 1927; mouldboard ploughed 4½ inches end May, 1929, scarified October, harrowed November, spike rolled and drilled April; sown with hoe drill 20th April and 8th May, seed 80 lb. (Marshall's No. 3, 60 lb.), superphosphate 80 lb. per acre.

Moorwatha (E. Ziebarth).—Soil, brown loam, undulating, deep and strong; old cultivation; wheat 1927; mouldboard ploughed August, 1928, harrowed October, scarified January and April, combine sown 7th and 16th May, seed 75 lb., superphosphate 100 lb. per acre.

Corowa (F. Knight).—Soil, brown loam, very old land; wheat 1928; mouldboard ploughed August, 1929, springtoothed January, April and again in May before sowing; sown with a hoe drill 12th and 21st May and harrowed, seed 70 lb., superphosphate 112 lb. per acre.

Tumbarumba (T. McAuliffe).—Soil, volcanic red loam; old land; wheat 1929; disc ploughed 4 inches 1st April and harrowed; oats sown on stubble with a hoe drill 10th April, seed 60 lb., superphosphate 90 lb. per acre.

RAINFALL Table.

	Jinders.	Brocklesby.	Balldale.	Culcairn.	Henty.	Holbrook.	Tumbarumba.	Wagga.	Marrar.	Milbrulong.	Urangeline.	Corowa.	Oaklands.	Berrigan.	Jerilderie	Morundah.	Finley.	Mathoura.	Balranald.
1929.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
July	113	62	48	76	53	81	162	41	56	19	23	24	32	32	32	23	22	23	17
August	278	176	192	320	196	267	323	207	157	61	177	150	189	152	147	203	104	112	115
September	299	213	192	331	327	361	334	261	169	239	24	160	313	86	128	232	82	70	93
October	122	83	52	45	57	65	94	90	45	77	12	57	101	101	113	73	151	228	38
November	81	89	46	55	82	115	288	162	130	11	41	24	93	30	56	56	42	74	94
December	176	148	159	25	192	219	281	31	28	12	105	41	63	36	31	79	57	55	50
1930.																			
January	0	25	0	0	19	12	67	87	10	60	0	0	17	0	0	0	0	0	14
February	35	0	5	16	27	46	162	48	35	11	9	8	9	6	6	0	0	0	0
March	40	21	4	7	9	64	57	165	38	0	16	30	11	24	26	25	29	80	40
Total on Fallow ...	1,144	817	698	875	942	1,230	1,768	1,092	668	490	407	494	828	467	539	691	487	642	461
April	133	106	117	125	105	149	198	60	75	80	77	133	73	87	69	81	80	17	42
May	220	219	208	167	235	160	227	161	147	291	115	132	127	109	143	190	218	128	97
June	124	76	87	111	111	172	211	177	176	131	74	70	102	38	59	181	35	1	5
July	222	95	115	197	194	246	328	126	153	144	148	139	121	117	118	138	121	102	82
August	384	190	252	367	371	366	490	324	241	264	160	267	227	166	201	196	172	127	166
September	99	52	48	43	63	51	210	100	85	70	30	74	32	34	24	69	32	57	56
October	440	310	290	355	460	416	583	375	380	348	262	297	283	292	268	305	313	165	206
November	179	134	155	142	172	182	259	100	254	150	130	223	115	87	91	75	99	66	41
December	864	510	646	563	531	702	725	825	313	424	606	778	684	976	848	457	811	370	171
Total on Crop ...	2,665	1,692	1,918	2,070	2,242	2,444	3,231	2,248	1,824	1,902	1,602	2,113	1,764	1,906	1,821	1,692	1,881	1,033	866

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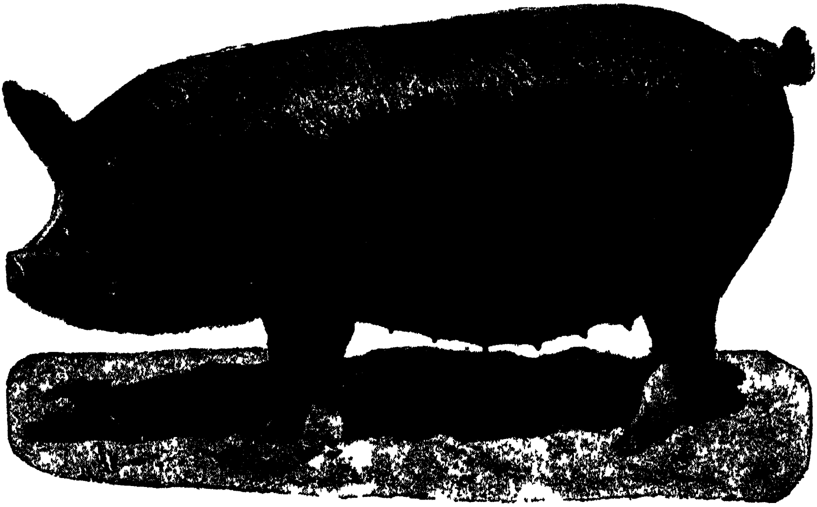

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Full particulars regarding prices, &c., can be obtained on application from the Principal, Hawkesbury Agricultural College, Richmond, or from the managers of the farms mentioned.

G. D. ROSS, Under Secretary, Box 36A, G.P.O., SYDNEY.

Holbrook (G. Perry).—Soil, brown loam, billabong country; old land; wheat 1928; mouldboard ploughed 5 inches August. 1929, harrowed September, springtoothed November and April; combine sown 20th May, wheat 70 lb. seed and 100 lb. superphosphate per acre, oats 60 lb. seed and 80 lb. superphosphate per acre.

Uranquinty (T. Rodham).—Soil, red loam, undulating; old land; wheat 1928; mouldboard ploughed 4½ inches June, 1929. harrowed September, springtoothed October, disced early January, scarified May; sown with a disc drill 20th May, wheat 70 lb. seed and 84 lb. superphosphate per acre, oats 60 lb. seed and 84 lb. superphosphate per acre. The seeding and manurial trials were sown earlier.

Marrar (E. H. G. Eldershaw).—Soil, red to brown loam, undulating, granitic origin; very old land; wheat 1928; mouldboard ploughed 4½ inches August, 1929, harrowed September, scarified October, end January and April; sown with a combine 10th May, seed 70 lb., superphosphate 85 lb. per acre. Harrowed 11th May and again after rain on 15th May.

Henty (R. Nottle).—Wheat trial; soil, brown loam; old land; oats 1928; mouldboard ploughed 4½ inches August, 1929, harrowed and scarified October; combine sown 25th April and 8th May, seed 75 lb. (Marshall's No. 3 and Yandilla King 60 lb.), superphosphate 112 lb. per acre. Oats on stubble trial; soil, brown loam; old land; wheat 1929; disc ploughed 3 inches March, 1930, and harrowed; combine sown 20th April, seed 60 lb., superphosphate 60 lb. per acre.

Munyabla (C. Campbell).—Soil, brown loam, undulating; very old land; wheat 1928; mouldboard ploughed 4½ inches August, 1929, harrowed and springtoothed October, springtoothed May; combine sown 20th May; wheat 75 lb. seed and 112 lb. superphosphate per acre; oats, 60 lb. seed and 70 lb. superphosphate per acre; harrowed four days after sowing.

Milbrulong (J Gollasch).—Soil, red loam, undulating; old land; oats 1928; mouldboard ploughed 4½ inches June, 1929, springtoothed August, scarified September, January and prior to sowing with a combine on 6th and 12th May; wheat, 70 lb. seed and 112 lb. superphosphate; oats, 60 lb. seed and 112 lb. superphosphate per acre. The manurial and seeding trials were sown before the rains and poor germinations were obtained.

Urangeline (D. J. McLelland).—Soil, red loam, undulating granitic origin; wheat 1928; mouldboard ploughed 4½ inches April, 1929, mouldboard ploughed back August and harrowed, springtoothed October, January and again before sowing; wheats sown 27th April (Waratah, Aussie and Bobin sown 12th May), seed, 63 lb., superphosphate 103 lb. per acre; oats sown 12th May, seed, 60 lb., superphosphate, 65 lb. per acre.

Balldale (C. McDonald).—Soil, brown loam, undulating; old land; wheat 1928; mouldboard ploughed end August, 1929, harrowed September, scarified April and again before hoe drilling 7th and 16th May; wheat, 72 lb. seed and 112 lb. superphosphate per acre; oats, 60 lb. seed and 84 lb. superphosphate per acre.

Balranald (H. W. Oberin).—Soil, red sandy loam, mallee country Fallowered in 1928, cropped in 1929, but failed and was fed off. Land worked up again in October after rain; springtoothed in February, and sowing done with a combine on 10th April. Wheat sown at rate of 70 lb. with 84 lb. superphosphate, and oats 60 lb. seed and 60 lb. superphosphate.

Oaklands (A. Kerr).—Soil, red loam; fifth crop; oats 1928; disc ploughed 4 inches July, 1929, harrowed August, springtoothed October and April: combine sown 2nd May; wheat, 70 lb. seed, 70 lb. superphosphate per acre; oats, 60 lb. seed and 70 lb. superphosphate per acre.

Berrigan (W. Thornton).—Soil, heavy red loam, plain country, old land; wheat 1928; mouldboard ploughed 4 inches June, harrowed and spike rolled September, springtoothed September and October, springtoothed and harrowed April; sown with a hoe drill 1st May; wheat, 75 lb. seed and 100 lb. superphosphate per acre; oats, 58 lb seed and 60 lb. superphosphate per acre.

Finley (W. Waite) —Soil, red plain; wheat 1928; disc ploughed and harrowed March, 1929, mouldboard ploughed back 3 inches in October, springtoothed November, harrowed March and April; combine sown 29th April and harrowed; wheat, 70 lb. seed and 104 lb. superphosphate per acre; oats, 40 lb. seed and 60 lb. superphosphate per acre.

Jerilderie (F. A. McPherson) - Soil, red heavy plain; fourth crop; wheat 1928; sundercut 4 inches June, springtoothed September; combine sown 22nd April and harrowed; 70 lb seed, 112 lb. superphosphate per acre. Fed off mid-July.

Morundah (P McLennan).—Soil, heavy red plain: old land; wheat 1928; scarified 3 inches June, 4 inches July, 2 inches in August and September, harrowed October, scarified and harrowed before sowing with a hoe drill on 16th May; wheat, 70 lb. seed and 84 lb. superphosphate per acre; oats, 60 lb. seed and 56 lb. superphosphate per acre.

Mathoura (W. Glenn).—Soil, red plain: old land; wheat 1928; disc ploughed 4 inches June-July, springtoothed October, harrowed April; sown with a hoe drill and harrowed 15th April; seed 75 lb, superphosphate 84 lb. per acre.

Maulamein (W. J. Symes).—Plot failed.

Comments.—In many cases last season late fallow (end August) gave better results than early fallow (June). Conditions were dry in the winter, and land that was ploughed in August after a good break was in better condition all through the season than that ploughed in a dry or a semi-dry state earlier. On the other hand, land that was ploughed a little earlier (after the break at the end of April) gave better results still. It appears that the condition of the land at ploughing time has an important bearing on the subsequent success of the fallow.

Fallows that were worked once or twice before harvest paid handsomely for the trouble; wherever advantage was taken of a good shower to work the fallows during the hot months, an increase in yield was obtained.

Where sowing had to be done under dry or semi-dry conditions, better results were obtained by deferring the harrowing until rain fell. Where the crops were harrowed immediately after rain germination was good, but a delay in this operation until trouble was noticed, although helping the crop considerably caused a considerable loss.

YIELDS of Wheat Variety Trials.

	Gerogery.	Jindera.	Walla (Walkyrie.)	Moorwatha. (Brocklesby.)	Holbrook	Tranquinty	Marrar.	Henty. (Osborne Ck.)	Munyabla	Milbrulong.	Urangeline (Bidgeemia)	Balldale.	Corowa (Ringwood)	Oaklands.	Berrigan.	Finley.	Jerilderie.	Morundah.	Mathoura (Bunaloo).	Balranald.
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Bald Early	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3¾	...	...	...	...	11½
Gullen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	12¾	11¾	...	...	...
Clarendon	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11¾	...	...	...
Aussie	...	40	35¼	...	...	...	...	19¼	31½	...	40½	...	...	...	...	...	...	...	...	...
Waratah	33½	41¼	35½	35¾	45¼	34¼	...	25¾	30¼	34	40¼	37¼	22¾	29½	6¼	14¾	18½	16¾	8	8¾
Bobin...	40¼	...	...	45¾	43¼	35¾	43¼	26½	39½	40	41	43¼	30½	31¾	8	12¾	17¼	21½	6	11
Ranee	...	...	...	...	...	...	...	...	...	...	...	...	...	27½	7¼	14¼	17¾	...	8¼	12
Nabawa	36½	30¾	37¾	29¼	44¾	31¾	36½	28¾	35½	28¾	40¾	...	24½	28½	7¾	17½	19¼	17¾	...	13½
Geeralying...	...	...	...	...	...	...	...	...	..	30	...	...	...	30	...	...	...	...	...	...
Rajah	...	...	...	...	...	...	...	...	...	...	...	...	...	30¾	...	12½	15¼	...	...	11
Huff's Imperial	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	4	...
Riverina	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14¾	...	...
Nizam	...	...	...	...	...	...	...	...	27¼	...	...	...	...	...	...	...	...	8½	...	10¾
Union	...	30½	32¾	39¾	46¼	33½	35¼	32¼	28¾	25	23¾	32¼	21	...	3½	9¼	13	14½	5	6½
*Federation (N.S.W.) ...	...	...	...	...	...	...	...	...	...	27	...	23¼	...	...	2¾	9¼	14¾	12	4¼	9¼
*Federation (Longerenong)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1½	8	...	14¾	4¾	...
Gallipoli	31	37¾	33¾	37½	44½	36¼	36	36	23	30¼	27¼	34¼	26¾	19	3	6¾	16¼	11¼	6½	12¼
Bena	...	34½	...	35½	...	34¼	...	...	...	20½	...	...	21¾	...	...	...	...	...	...	...
Duchess	20¼	...	...	...	...	...	35	41½	...	20½	...	...	...	...	...	...	...	...	...	...
Bredbo	...	...	...	...	33½	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Onas	...	...	...	...	...	...	...	...	...	...	26¾	...	...	...	...	...	...	...	...	...
Burchert's Special ...	...	...	...	...	...	...	...	...	...	29¾	...	...	...	...	...	...	...	...	...	...
Turvey	...	...	30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Penny	...	...	36½	...	...	...	...	35¼	...	...	...	33¾	...	...	...	...	...	...	...	...
Wandilla	...	...	...	...	40¾	...	...	...	...	...	...	...	15¼	...	...	...	...	...	...	...
Exquisite	16¾	...	...	...	39¼	34¼	33½	...	31¾	...	...	...	...	...	...	...	...	...	...	...
Marshall's No. 3	23¾	37¾	23	35¾	39½	30¾	34¼	33¾	26¾	...	24¼	25½	25¼	...	...	...	...	...	...	...
Yandilla King	35¾	32½	33½	38¾	40¾	33½	41¼	38¼	31¼	23	28¾	25¼	25¼	...	...	...	...	...	...	...
Yanwood	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	7¾
Currawa	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9¾

* For three seasons a trial has been carried out with Federation, using the Longerenong (Victorian) strain and New South Wales strain, but there seems to be very little between them.

Notes on Varieties.

The yields of Bobin as an early wheat, and of Yandilla King as a late variety, were outstanding. This is the second year Bobin has done well, and Yandilla King has rapidly superseded Penny, Major, Turvey and Marshall's No. 3 in the Riverina, except on the lighter soils. Turvey and Penny still do well on the silty loams of south-eastern Riverina, near Albury.

Ranee is a little later by a few days than Waratah, and does well in the western districts. Nabawa, Gallipoli, Union and Bena are mid-season varieties that have been doing well. Nabawa is flag smut resistant, but is susceptible to leaf spot and rather weak in the straw. Gallipoli has good straw, but is very susceptible to leaf spot. Union and Bena have good straw, but are rather susceptible to flag smut and rust.

Waratah, as an early wheat, still seems to give good returns, despite a tendency to shell and lodge, it is fairly hardy and a good wheat to sow on light country, on stubble or on lay ground. During the two previous seasons Duchess gave large yields and showed great promise, but this year it lodged very badly and showed weakness in the straw. Exquisite has given high yields but matures a poor sample, it is flag smut resistant, but is very thin in the straw, rather late and tall. Wandilla is highly flag smut resistant, but as a general-purpose late wheat it is inferior to Yandilla King.

Geeralying, like Nabawa, is highly resistant to flag smut and is rather promising. Nabawa appears to be a good variety to sow on stubble; apparently it is an advantage to sow it a little later and with a little more seed than what was first thought.

Wheat Manurial Trials.

The yields of the manurial trials of wheat are shown in the following table:—

YIELDS of Wheat Manurial Trials.

Fertiliser per acre	Gerogery (Yandilla King)	Jindera (Waratah)	Jindera (Yandilla King)	Corowa (Marshall's No 3)	Uranquinty (Yandilla King)	Milbrulong (Yandilla King)	Berrigan (Waratah)	Finley. (Bobin)	Jerilderie (Ranee)	Morundah (Gallipoli)	Mathoura (Federation)
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
No manure	...	...	...	...	...	...	...	8¼	...	...	...
Superphosphate, 56 lb.	...	...	...	...	30	...	7¼	...	17¾	11	3
Superphosphate, 84 lb.	...	...	...	25	33½	22	6	14½	20¼	11½	4½
Superphosphate, 100 lb.... ...	...	...	...	...	...	...	6¼	12¾	...	...	...
Superphosphate, 112 lb.... ...	35¾	41¼	32½	25¾	37¼	23	...	...	28¾	14¼	3¾
Superphosphate, 112 lb., and bonedust (equal parts).	36	...	...	...	...	21½	...	14¾	...	...	...
Superphosphate, 140 lb.... ...	...	...	...	26½	...	24½	...	10¾	...	...	...
Superphosphate, 180 lb.... ...	...	40¾	30¼	...	...	...	...	...	25½	...	...

The phosphate in bonedust is in an insoluble form, and up till the later stages of growth these plots were a long way behind in appearance. During the finishing period they came along very well; probably, being a little behind, they received some benefit from the late rains in October.

Good results were obtained with applications of superphosphate up to 1 cwt. per acre, but the larger amounts, up to 180 lb., resulted in a reduction in yield.

Rate of Seeding Trials with Wheat.

The yields in the wheat rate of seeding trials were as follows:—

Yields of Rate of Seeding Trials with Wheat.

Seed per Acre	Uranquinty (Yandilla King).	Milbrulong (Yandilla King).	Berrigan (Waratah)	Jerilderie (Ranee)	Morundah (Gallipoli).	Mathoura (Federation).
	bushels.	bushels.	bushels.	bushels.	bushels.	bushels.
60 lb.	...	22	..	28¾	...	...
65 lb.	30½	. .	6¼	...	13¼	...
70 lb.	...	23	...	..	...	...
75 lb.	33½	.	6¼	17¾	12½	*5
75 lb.	...	..	...	...	...	†4½
80 lb.	...	23½	...	...	...	...
85 lb.	35¾	...	6¾	...	9¾	...

* Pedigree seed. † One year removed from pedigree seed

It will be noted that at Uranquinty and Milbrulong heavy seeding gave the best results with Yandilla King. In these cases this variety was sown early and received a poor start because of faulty germination.

Diseases in Wheat.

Flag smut, foot rot, take-all, and rust were very prevalent, and during the late winter heavy infection of leaf spot (*Septoria*) occurred and checked several varieties rather severely.

There was a general infection of rust, but except at Tumbarumba most of the varieties were too far forward for this disease to do much harm. Aussie showed resistance to rust and Waratah, a fair amount of resistance.

The purple straw varieties appeared very susceptible to flag smut, *e.g.*, Purple Straw, Marshall's No. 3, Turvey, &c. Gallipoli, Aussie, Canberra, Union, Nizam, Federation, Bena, Duchess, Bredbo, Penny, Onas, and Ranee also showed marked susceptibility, while Waratah and Bobin showed susceptibility, but not to the same extent. Varieties showing considerable resistance were Yandilla King, Exquisite, Gullen, Riverina, and Wandilla, while Nabawa and Geeralying were almost immune.

The varieties which showed resistance to flag smut, viz., Nabawa, Geeralying, Wandilla, and Riverina were highly susceptible to leaf spot, and Gallipoli and Penny were also very susceptible.

Nabawa, Gallipoli, Turvey, Federation, Union, and Bena showed susceptibility to foot rot and take-all.

Oat Variety Trials.

The following table shows the yields in the oat variety trials:—

Yields of Oat Variety Trials.

Variety.	Jindera.	Holbrook.	*†Tumbarumba.	Uranquinty.	* Henty.	Munyabla.	Mibrulong.	Urangeline	Balldale.	Oaklands.	Berrigan.	Finley.	Morundah.	Balranald.
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Mulga	79¼	49	...	57¾	31½	40¼	59	60¾	...	24½	8½	20¾	37½	13
Palestine... ...	...	...	...	48¾	...	...	...	...	46¼	...	...	8½	16	5½
Myall	...	...	...	. .	. .	...	...	...	...	...	...	...	25½	...
Gidgee	55½	...	...	..	31¼	...	...	...	. .	...	...	...	...	...
Buddah	...	...	...	..	.	...	...	...	...	...	...	16½	...	...
Belar	68	74½	34½	48	54¼	51	54¼	45	...	30	6¼	15¾	23¼	8¼
Guyra	60	49¼	44½	53¼	...	57¼	59	62	...	33¼	14½	...	...	...
Lachlan	...	70¾	39¼	...	...	...	...	...	59¼	...	. .	...	..	...
Algerian	52¾	...	42	49½	45¼	55¼	53¼	...	47¾	...	...	...	...	...
Sunrise	...	...	...	..	...	...	...	...	...	...	...	...	...	6½

* Sown on stubble † Fed off from 5th July to 19th August

Palestine proved to be much inferior to Mulga, and Algerian is still the best late oat. The yields of the early-maturing oats, Mulga, Belar, and Guyra are noteworthy. Guyra yields well, but is thick in the husk and unattractive; although it has plump grain for home feed, it is not in demand by buyers of grain. Mulga and Belar both make good hay, and have attractive grain. Lachlan yields well, but like Guyra, has a thick husk and is unattractive.

Oat Manurial Trials.

The following table shows the yields in the manurial trials with oats for grain:—

Yields of Oat Grain Manurial Trials.

Fertiliser per Acre.	Uranquinty. (Belar)	Milbrulong. (Mulga).
	bushels.	bushels.
No Manure	56¾	...
Superphosphate (56 lb.)	48½	58
Superphosphate (84 lb.)	...	59
*Nitro-superphosphate (84 lb.)	...	61
†M. 17 Mixture (84 lb.)	...	59
*Nitro-superphosphate (100 lb.)	39¾	...
†M. 17 Mixture (100 lb.)	42¾	...
Superphosphate (100 lb.)	44½	...

* Nitro-superphosphate contains 1·7 per cent. nitrogen.

† M. 17 contains two parts superphosphate and one part sulphate of ammonia (7 per cent. nitrogen).

At Uranquinty the oats were sown on good fallow following a wheat crop that had been heavily manured. The seasonal conditions were erratic, and the unmanured plot, being much behind the manured areas in maturity, responded to the late rains.

A manurial trial with oats for hay was carried out by Mr. E. Hamblin, "Revenstone," Ganmain. The oats were combine sown on wheat stubble on 7th April, using 45 lb. seed. The stubble was burnt and springtoothed early in March, a harrowing was given after sowing, and the crop was cut on 10th November.

YIELDS in Manurial Trial with Oats for Hay.

Fertiliser per acre.	Yield.			
	tons	cwt.	qr.	lb.
No Manure	1	14	0	10
46 lb. Superphosphate	1	19	1	10
86 lb. Superphosphate	2	3	1	8
124 lb. Superphosphate	2	9	3	14
70 lb. Nitro-superphosphate	2	2	0	14
95 lb. Blood and Bone and Superphosphate	2	0	0	0
70 lb. M. 17 Mixture	2	1	2	23
108 lb. Cresco Ammonia Phosphate	2	4	3	22

Algerian was the variety used in the above trial. Plots of Guyra and Belar manured with superphosphate at the rate of 86 lb. per acre yielded 2 tons 2 cwt. 1 qr. 20 lb. and 2 tons 9 cwt. 2 qr. 2 lb. per acre, respectively.

In the Algerian trial a comparison of the results obtained with applications of 86 and 124 lb. superphosphate is interesting. By increasing the application 38 lb. (worth 1s. 11½d.) an increased yield of 6 cwt. 2 qr. of hay (worth 19s. 6d.) was obtained.

South-western District.

D. V. DUNLOP, H.D.A., Agricultural Instructor.

Wheat and oat experiments were conducted in co-operation with twenty-eight different farmers in the south-western district during 1930.

A Remarkable Season.

The past season was one of the most remarkable ever experienced in the south-west. After a most favourable beginning it finished in a most disappointing manner for the majority of farmers in the Riverina and south-western plains sections. For a more detailed comment on the season readers are referred to the author's report on the south-western district wheat crop-growing competitions (see *Agricultural Gazette*, February, 1931, page 121).

The following table shows the rainfall registrations at the different centres. It is interesting to note that approximately one-third of the total rains received during the growing period, fell during October.

RAINFALL Registrations.

Month.	Lake Cargelligo (G. P. Circuitt).	Tullibigeal (H. J. Harley).	Kikoira (E. Douglas).	Ungarie (D. L. Johns).	Ungarie (J. McMahon).	Euratha (C. E. Burdett).	Euratha (J. R. Somers).	Weethalle (F. E. Schmidt)	Barellan (G. Gow).	Barellan (A. J. Manning).	Moombooldool (P. Corcoran).	Merriwagga (E. S. Hazeldine).	Budawong (L. Moore).	Ariah Park (G. G. Ballantine).	Cunningar (B. J. Stocks).	Batlow (J. E. Dodds).	Muttama (H. Rumble).	Young (R. H. Thackeray).
1929.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
June ...	...	...	...	...	28	...	...	...	13	...	...	...	33	29	114	(Not fallowed.)	101	...
July ...	...	20	...	13	12	...	...	32	29	...	165	...	38	45	59		86	33
August ...	...	275	...	215	247	..	78	210	163	187	159	101	90	120	211		243	175
September ...	140	234	...	196	193	...	146	183	153	144	219	73	75	216	103		245	86
October ...	73	65	...	47	39	...	15	40	53	45	34	112	91	35	47		91	49
November ...	133	71	...	...	...	...	143	121	109	80	121	147	141	196	202		183	256
December ...	235	136	...	..	..	..	101	102	105	128	134	196	119	170	275		260	253
1930.																		
January ...	10	6	3	...	..	61	10	14	16	...	24	49	93	6	3		...	41
February ...	51	5	36	10	158	..	37	46	43	45	102	6	29	14	108		28	74
March ...	...	78	62	34	85		...		13	...	...	...	8	5	170		6	31
Total on fallow ...	642	890	...	...	...	.	580	748	697	629	958	684	717	936	1,292	...	1,243	998
April ...	126	100	104	75	65	43	51	59	52	100	74	37	29	73	13	263	57	175
May ...	88	114	88	138	107	61	58	70	105	95	68	77	225	93	108	602	137	177
June ...	162	204	134	110	144	149	167	154	200	159	174	179	86	100	160	275	148	...
July ...	142	138	111	104	83	90	83	87	112	107	124	76	102	119	132	420	168	...
August ...	61	121	110	125	101	172	117	128	196	187	228	149	121	259	174	700	287	...
September ...	31	21	29	19	10	33	27	39	76	54	50	31	29	58	75	276	90	...
October ...	349	270	279	312	214	330	304	267	313	326	336	271	410	350	421	1,096	442	...
Total on growing crop ...	959	968	855	883	724	878	807	804	1,054	1,028	1,054	820	1,002	1,052	1,083	3,632	1 329	...

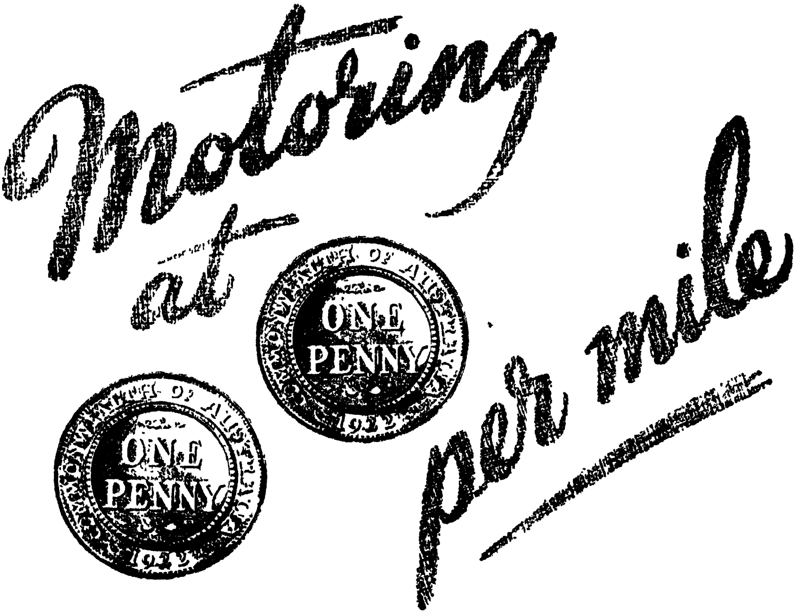
Cultural Details.

Lake Cargelligo (G. P. Circuitt).—Soil deep light loam. Mouldboard ploughed 4 inches in September, springtoothed in November, December and April; sown on 20th April, using 60 lb seed and 45 lb. superphosphate per acre. The seed-bed was dry, but otherwise in good order. Rain fell a few days after sowing and ensured a good germination.

Lake Cargelligo (T. W. Turner).—Soil medium red loam. Disc ploughed 3 inches in August, springtoothed in April and early May; sown with a hoe drill on 7th May, using 55 lb. seedand 56 lb. superphosphate. The seed-bed was moist and germination was good. The yield of Federation was reduced by flag smut, while Gallipoli suffered most severely from the dry September.

Burgooney (Franklin and Cook).—Soil light deep mallee, this being its second crop. Ploughed in July and August 3 inches deep, springtoothed October and January; sown with a combine on 14th April in dry fine seed-bed. Germination was good, but all plots burnt very badly during September and were cut for hay.

Tullibigeal (H. J. Harley).—Soil medium heavy red loam, old cultivation. Ploughed 4 inches deep in July, springtoothed October and scarified in January; sown with a hoe drill on 16th April, using 60 lb. seed and 60 lb. superphosphate. The seed-bed was dry, but germination was excellent.



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SYDNEY - AUSTRALIA.

Tullibigeal (J. Dillon).—Old cultivation land, medium red loam. Ploughed 4 inches deep in August, springtoothed October and April; sown 21st and 22nd April with a combine, using 60 lb. seed and 56 lb. superphosphate. The seed-bed was dry, but the germination was very good.

Weja (G. A. Wallace).—Soil medium brown loam, scarified end January 3 inches deep and again in May, September, October and January, springtoothed February; sown 23rd and 24th April with a combine using 60 lb. seed and 84 lb. superphosphate. Waratah, Canberra and Gallipoli were sown dry, the remainder being sown after a fall of 1 inch of rain.

Ungarie (D. N. Johns).—Soil heavy brown clay, mouldboard ploughed 3½ inches deep in July, scarified in September, harrowed in November, scarified March and again before sowing; sown 28th and 29th April, using 50 lb. seed and 84 lb. superphosphate. The seed-bed was moist and germination was excellent.

Ungarie (J. McMahon).—Old cultivation land, medium heavy red loam Springtoothed March, and sown with a combine in April, 1929, but fed off; mouldboard ploughed 3½ inches deep in October and springtoothed in December; sown 28th April with a combine, using 58 lb. seed and 84 lb. superphosphate per acre. Germination was good, but all plots were severely checked by the dry spell. Federation, Union, Rance and Nizam were heavily infected with flag smut. Nabawa benefited by drainage from a roadway.

Kikoira (E. Douglas).—The plots constituted the fifth crop on this medium red loam, which was sundercut 3 inches deep in May, scarified June and December, harrowed April; sown with combine on 22nd April, using 50 lb. seed and 84 lb. superphosphate. The seed-bed was dry and the germination was good.

Euratha (J. R. Somers).—Light mallee loam, this being its fifth crop. Disc ploughed 4 inches deep in August, harrowed September, springtoothed October and December and scarified in February; sown with a combine on 28th April, using 45 lb. seed and 56 lb. superphosphate. The seed-bed was moist, rather fine and deep.

Euratha (C. E. Burdett).—New mallee, light sandy loam. Mouldboard ploughed 3½ inches deep in June and harrowed in January and April; sown with a drill on 29th April, using 45 lb. seed and 84 lb. superphosphate. The seed-bed was moist.

Weethalle (F. E. Schmidt).—Soil medium heavy red loam, mouldboard ploughed 3 inches July-August and harrowed immediately, scarified October, February and April, and sown with a combine on 30th April, using 55 lb. seed and 84 lb. superphosphate. The seed-bed was moist.

Merriwagga (E. S. Hazeldine).—Soil medium red loam, this being its sixth crop. Mouldboard ploughed 3½ inches deep in August, springtoothed November and harrowed January; sown with a combine on 8th April, using 50 lb. seed and 56 lb. superphosphate. The seed-bed was dry, but germination was good.

Merriwagga (T. H. Emery).—Light mallee soil, this being its first crop. Scarified in May, 1929, and again April, 1930; sown with a combine on 9th and 10th April, using 45 lb. seed and 56 lb. superphosphate. The seed-bed was dry, loose and open, and the plots burnt off badly. Yandilla King failed and was not harvested.

Budawong (S. Moore).—Soil medium loam, this being its fourth crop. Mouldboard ploughed in December, springtoothed December and harrowed end of January; sown with a combine on 10th April, using 50 lb. seed and 56 lb superphosphate. The seed-bed was dry.

Tabbita (R. E. Brumby).—Mixed mallee and pine, light, deep loam having its fourth crop. Scarified 3 inches deep in July, cross scarified August, springtoothed October, November and December; sown 11th April with a combine, using 50 lb. seed and 56 lb. superphosphate. The seed bed was dry and fine.

Barellan (G. Gow).—Heavy brown self-mulching soil, old cultivation. Mouldboard ploughed 3½ inches deep in July, springtoothed in August; sown 10th May with a combine, using 60 lb. seed and 60 lb. superphosphate. The seed bed was moist, 70 points falling the day after sowing. Germination was rather poor.

Barellan (H. T. Manning).—Soil medium heavy red loam, old cultivation. Ploughed 3½ inches deep in August, harrowed and springtoothed before harvest; sown 1st and 2nd May with a combine, using 60 lb. seed and 84 lb. superphosphate. Geeralying shelled badly and lost at least 5 bushels; being the first to ripen it encountered some rough, windy weather.

Colinroobie (A. H. Jennings).—Soil medium red deep loam, old cultivation. Mouldboard ploughed 4 inches deep in July and then harrowed, disced in September, springtoothed January and April; sown 26th April, using 60 lb. seed and 84 lb. superphosphate. The yield of Union was reduced by flag smut. The oat plots at this centre made excellent growth, but rains at harvest time caused them to lodge badly and they could not be harvested.

Moombooldool (P. Corcoran).—Light red sandy mallee soil, old cultivation. Mouldboard ploughed 3½ inches deep in July, scarified October, harrowed November and springtoothed April; sown on 26th April with a disc drill, using 45 lb seed and 112 lb. superphosphate. Germination was excellent.

Moombooldool (C. Joyner).—Light red mallee soil, this being its sixth crop. Mouldboard ploughed 3½ inches in August, springtoothed October and February, and sown 2nd May, using 60 lb. seed and 56 lb. superphosphate. Mulga and Palestine lodged and had to be cut for hay.

Ariah Park (D. W. Edis).—Soil medium deep red loam, scarified in February, springtoothed May, and scarified in October and May; sown on 15th May, using 70 lb. seed and 84 lb. superphosphate The seed bed was moist and germination excellent.

Ariah Park (G. G. Ballantine).—Soil dark brown heavy clay, old cultivation. Disc ploughed 3½ inches in June, harrowed August, springtoothed

December and harrowed in April; sown with a hoe drill on 16th and 17th May, using 60 lb. seed and 84 lb. superphosphate. The seed bed was moist and germination excellent.

Muttama (H. Rumble).—Soil light brown sandy loam, old cultivation. Mouldboard ploughed 4 inches deep June-July, springtoothed August, September, April and May, and sown with a disc drill on 14th May, using 60 lb. seed and 84 lb. superphosphate.

Gunningbar (B. J. Stocks).—Soil light brown granitic loam, old cultivation. Ploughed 4 inches deep in July, scarified September and October, harrowed January and March, and scarified May; sown on 22nd May, using 60 lb. seed and 84 lb. superphosphate. The seed bed was moist, clean and compact, but rather deep.

Kingsvale (G. H. Coddington).—Soil friable brown loam, old cultivation. Mouldboard ploughed 4 inches in August, harrowed September, springtoothed November, December and January; sown with a combine on 9th May, using 60 lb. seed and 84 lb. superphosphate. The germination was rather poor, and all varieties grew somewhat rank. Yandilla King, Marshall's No. 3, and Exquisite lodged in patches.

Young (R. H. Thackeray).—Soil medium granitic brown loam, old cultivation. Mouldboard ploughed 4 inches deep in August, harrowed October, scarified December, January, March, and May; sown with a hoe drill on 20th May, using 60 lb. seed and 84 lb. superphosphate.

Batlow (J. E. Dodds).—Soil red volcanic loam, previous crop potatoes. Ploughed and harrowed in August, and sown on 18th August with 160 lb. seed and 112 lb. superphosphate per acre. Germination was very good.

Wheat Variety Trials.

In the earlier portions of the district a marked superiority was shown by the early and mid-season maturing wheats over the late ones. The unusual season favoured these wheats, but, taking results over a number of years, early and mid-season wheats appear best suited to these areas. On the slopes and more favoured localities, late wheats more than held their own.

Bobin and Nabawa.—Among the early and mid-season varieties Bobin and Nabawa were again most successful. Waratah did better than in the previous year, but wherever these three varieties were tried under similar conditions, Waratah gave the lightest yield, except at Tullibigeal, where it yielded 48 lb. per acre more than Bobin.

Rajah showed to advantage and outyielded Waratah, except at Barellan. These results are not due to any inability of Waratah to withstand dry conditions, but to its greater liability to flag smut infection. Although this disease was not very serious this season, except at isolated places, it is interesting to note that the lightest attacks on Waratah occurred at Tullibigeal and Barellan.

YIELDS of Wheat Variety Trials.

Variety.	Lake Cargelligo (G. P. Circuitt).	Lake Cargelligo (T. W. Turner).	Tullibigeal (H. J. Hurley).	Weja (G. A. Wallace).	Ungarie (D. N. Johns).	Ungarie (J. McMahon.)	Kikoira (E. Douglas).	Euratha (J. R. Somers).	Euratha (C. E. Burdett).	Weethalle (F. E. Schmidt).	Merriwagga (E. S. Hazeldine).	Merriwagga (J. H. Emery).	Budawong (L. Moore).	Barellan (G. Gow).	Barellan (H. J. Manning).	Collinroobie (A. H. Jennings)	Moombooldool (P. Corcoran).	Ariah Park (D. W. Edis).	Ariah Park (G. G. Ballantine).	Muttama (H. Rumble).	Cunningar (B. J. Stocks).	Kingsvale (G. Coddington).	Young (R. H. Thackeray).
	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb	b lb.	b. lb	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.	b. lb	b. lb.	b. lb.	b. lb.	b. lb.	b. lb.
Aussie	16 49	...	...	27 32	...	...	...	...	...	15 13	...	...	...	...	...	...	...	31 58	...	...	35 3	...	...
Barootа Wonder	...	...	...	...	...	...	...	8 5	...	...	...	...	9 28	...	...	...	...	...	...	...	...	...	...
Bena	...	...	...	...	...	...	...	...	...	...	...	...	...	15 30	...	...	...	...	29 50	...	...	26 0	...
Bobin	19 29	23 32	29 12	...	...	16 6	19 0	...	...	19 51	14 0	...	...	...	19 20	...	28 4	38 24	...	...	32 6	...	...
Bredbo	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	37 30	31 32	...
Cadia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	26 50	...	24 24	29 50
Canberra	...	...	...	20 32	...	...	...	...	...	...	13 38	...	...	...	...	...	...	...	...	...	...	...	...
Canimbla	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	26 54	...	...	32 27
Currawa	...	...	...	...	...	...	12 21	...	8 50	...	...	3 59	...	...	...	...	18 0	...	...	25 14	...	...	...
Duchess	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	40 25	...	...	...	...
Dundee	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	29 45	...	...	...	...	34 5
Duri	16 42	...	...	...	...	...	...	...	...	16 3	14 39	...	...	...	...	...	...	...	...	...	...	...	...
Exquisite	...	...	...	...	26 47	...	...	...	...	...	...	...	...	...	...	...	20 45	...	...	...	...	22 27	...
Federation	13 34	11 40	21 21	...	13 53	4 30	18 49	6 25	...	...	...	...	...	11 0	...	...	...	...	...	...	...	...	...
Ford	...	...	...	...	25 47	...	16 19	...	...	7 6	...	7 50	...	17 10	...	30 0	24 19	...	33 30	29 58	27 11	...	34 40
Free Gallipoli	...	8 14	27 53	19 36	...	6 5	14 28	...	...	5 25	9 0	...	...	16 30	...	23 10	...	32 29	38 42	...	37 17	...	34 52
Geeralying	...	...	21 12	...	...	...	...	9 20	...	...	...	...	...	...	*13 40	...	...	...	...	...	30 23	...	...
Gluyas Early	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gresley	...	...	...	...	...	...	...	9 30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gullen	14 37	...	...	21 0	...	...	...	...	...	12 41	...	...	...	...	...	...	...	...	30 44	...	...	...	...
Marshall's No. 3	...	...	...	...	19 45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	28 57	...	18 49	...
Nabawa	...	20 44	35 6	...	...	25 38	...	10 25	12 35	...	...	9 30	...	...	21 35	25 30	20 40	34 58	...	...	...	...	33 6
Nisam	...	...	...	14 14	...	6 48	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Penny	...	...	...	...	...	...	15 26	...	7 35	...	...	6 2	...	17 39	14 50	21 10	21 10	...	...	29 5	...	21 52	...
Rajah	...	...	...	26 36	...	15 3	...	...	14 45	...	13 6	...	13 40	...	16 45	...	...	...	...	...	...	...	...
Ranee	...	...	...	...	...	7 44	...	...	...	...	...	...	...	...	...	24 20	...	...	...	...	33 35	...	...
Riverina	...	...	...	...	...	...	...	...	...	...	...	...	16 20	...	...	...	...	...	...	...	...	...	...
Turvey	...	...	...	...	...	...	...	...	8 50	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Union	11 53	10 16	...	...	...	3 37	17 30	...	...	6 55	...	...	...	...	...	15 35	...	...	...	...	...	...	...
Waratah	...	15 3	30 0	20 4	...	...	18 2	8 55	...	13 27	9 54	...	12 56	...	17 30	...	...	30 0	...	...	28 29	...	...
Yandilla King	...	...	...	...	25 56	...	...	...	6 55	...	...	...	...	19 50	...	25 20	...	...	35 14	28 1	...	16 57	27 52

* At least 5 bushels were lost through shelling during a storm.

Aussie also did well and outyielded Waratah at each of the five centres where it was tried. Unfortunately it is also liable to flag smut, but it resists rust.

Geeralying, the earliest wheat tried, was highly resistant to flag smut, but cannot compare with Nabawa for yield.

Of the later maturing varieties, Ford, Duchess, Exquisite and Penny compared very favourably with Yandilla King.

Federation Strain Trials.

From this and the two previous years' trials, it is apparent that there is nothing to choose between the Victorian and New South Wales strains of Federation. This year's results were as follows:—

YIELDS in Federation Strain Trial.

Strain.	Tullibigeal	Ungarie	Barellan.	Average.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Victorian	21 21	13 17	11 0	15 13
New South Wales ...	21 21	13 53	10 30	15 15

Wheat Rate of Seeding Trials.

The results, which are not to be taken as conclusive, indicate the advisability of light to medium sowings in the drier districts.

YIELDS of Rate of Seeding Trials.

Seed per acre.	Weja. (G. A. Wallace.) Canberra Variety.	Euratha (J R. Somers.) Waratah Variety.	Merriwagga (J. H Emery.) Penny Variety.	Moombooldool. (P Corcoran.) Penny Variety.	Ariah Park. (D. W. Edis) Gallipoli Variety.	Kingsvale. (G H. Coddington.) Marshall's No. 3 Variety.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
30 lb.	......	9 25	4 38	......	......	......
45 lb.	20 18	8 55	6 2	21 10	31 42	......
60 lb.	20 32	7 55	6 8	21 0	32 29	18 49
75 lb.	......	......	......	......	32 22	19 39

Wheat Manurial Trials.

What little difference there was in the plots was in favour of the lighter applications, but it is not possible to draw any definite conclusions from the results. The more heavily manured plots made the most vigorous growth until September, when, due to lack of subsoil moisture, all plots burnt off badly. The late rains were also of greater benefit to the unmanured plots and to those fertilised with gypsum, due to the fact that they were not so forward when the rain came. It can be definitely stated that gypsum is of practically no value on the wheat soils of the south-west.

YIELDS of Wheat Manurial Trials.

	Superphosphate per acre.						No manure.	Gypsum (112 lb.) per acre).
	154 lb.	140 lb.	112 lb	84 lb.	56 lb.	45 lb.		
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus lb.	bus. lb.
Lake Cargelligo (G. P. Circutt—Federation) ...	...	...	...	13 5	9 20	13 34	...	...
Lake Cargelligo (T. W. Turner—Federation) ...	...	.	10 46	10 23	11 40	...	...	...
Tullibigeal (H. J. Harley—Waratah) ...	..	..	26 25	28 39	30 0	...	25 18	22 37
Weja (G. A. Wallace—Waratah) ...	..	...	23 20	20 4	18 47	...	...	...
Ungarie (D. N. Johns—Yandilla King) ...	...	..	23 20	25 56	22 3	...	..	...
Ungarie (J. McMahon—Federation) ...	..	...	5 48	4 30	4 23	...	...	...
Kikoira (E. Douglas—Federation) .	...	...	19 46	18 49	16 49	...	8 21	...
Euratha (J. R. Somers—Federation) ..	.	.	7 45	7 20	6 25	...	3 30	...
Euratha (C. E. Burdett—Currawa) ...	..	..	8 45	8 50	8 15	...	...	...
Weethalle (F. E. Schmidt—Waratah) ...	.	..	15 25	13 27	13 9	...	...	...
Merriwagga (E. S. Hazeldine—Waratah) ..	...	...	12 0	11 21	9 54	...	6 3	...
Budawong (L. Moore—Waratah)	...	...	10 15	12 34	12 56	...	...	8 34
Barellan (G. Gow—Federation)	...	.	10 0	10 30	11 0	..	...	9 46
Barellan (H. T. Manning—Waratah) ...	...	..	17 15	17 30	17 0	..	..	...
Colinroobie (A. H. Jennings—Yandilla King)	22 20	...	23 10	25 20	25 48	...	...	...
Moombooldool (P. Corcoran—Currawa) ...	20 0	19 0	18 0	...	...	...	*15 0	...
Ariah Park (D. W. Edis—Waratah)	...	...	30 8	30 0	29 10	...	...	..
Ariah Park (G. G Ballantine—Yandilla King)	...	..	36 57	35 14	31 18	...	...	27 14
Kingsvale (G. H. Coddington—Yandilla King)	...	...	16 34	16 57	...	...	...	...
Muttama (H. Rumble—Yandilla King) ...	...	...	30 46	28 1	24 35	...	...	...
Young (R. H. Thackeray—Yandilla King)	...	...	27 46	27 52	28 5	...	...	...
Cunningar (B. J. Stocks—Waratah) ...	...	...	31 10	28 29	31 9	...	...	...

* 1 cwt. superphosphate, and 28 lb. sulphate of ammonia.

Wheat Cultivation Experiment.

This experiment was again carried out by Mr. H. J. Harley at Tullibigeal, the results, although not conclusive, are interesting. The plot which was scarified in March and July and springtoothed in October and January yielded 18 bushels 8 lb.; the plot scarified in March, mouldboard ploughed in July and springtoothed in October and January yielded 16 bushels 34 lb.; the plot ploughed in June and springtoothed in January gave a yield of 16 bushels 7 lb., while the plot ploughed in June and springtoothed in October and January yielded 16 bushels 38 lb.

Oat Variety Trial.

Wet harvesting weather, together with strong winds, caused some shelling and lodging.

Buddah, an oat of the same class as Mulga, gives great promise for the drier parts. Yields were extremely high in the Young district, although some lodging also occurred there.

YIELDS of Oat Variety Trials.

Variety	Tullibigeal. (J Dillon)	Moombooldool (C. Joyner.)	Muttama (H. Rumble)	Young. (R. H. Thackeray.)
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	......	......	42 20	48 0
Belar	......	48 23	44 16	54 33
Buddah	27 9	......	......	......
Gidgee	22 0	25 10	......	......
Guyra	25 38	50 5	44 14	65 16
Lachlan	......	......	43 17	......
Mulga	26 19	*	34 16	57 23
Palestine	22 8	*	......	45 25
Sunrise	24 14	36 7	......	......

* Lodged due to excessive rains and no yields obtained

Oaten Hay Trial.

To avoid the heavy winter frosts in the Batlow district, where this trial was carried out, early spring sowing was decided on.

The yields were as follows:—

Variety.	Yield per acre. t.	cwt.	qr.	Variety	Yield per acre. t	cwt	qr.
Mulga	2	8	3	Guyra	1	15	0
Myall	2	2	0	Sunrise	1	14	2
Buddah	1	17	0	Belar	1	10	1

Temora District.

L. JUDD, H.D.A., Manager, Experiment Farm, Temora. and District Instructor.

During the 1930 season farmers in seven centres co-operated with the Department in carrying out wheat and oat experiments.

From the point of view of cereal production the season in the Temora district proved very disappointing. Moreover, very little rain had fallen on the fallows, and this, coupled with the absence of good soaking winter rains, left the soil without sufficient moisture reserves to tide the crops over the ensuing dry spring months. The effects of these unfavourable conditions were very noticeable during the latter part of August and September, particularly in the northern part of the district, where burning off was in evidence. The heavy falls in October relieved the position somewhat, but were too late to be of maximum benefit. Showery conditions and storms in late November and December caused serious inconvenience at harvesting and were responsible for lodging and a considerable quantity of second-grade grain.

RAINFALL Registrations.

	Marinna.	Eurongilly.	Dirnaseer.	Bribbaree.	Quandialla.
1930	points.	points.	points.	points.	points.
Total for fallow period...	805	(Not available.)	1,195	464	808
April	76	100	85	150	142
May	177	125	127	147	144
June	209	143	146	145	225
July	127	119	109	183	194
August	311	275	217	207	201
September	108	74	61	82	39
October	454	404	362	432	409
November	143	84	75	71	77
Total for growing period	1,565	1,324	1,182	1,417	1,431

Cultural Details.

Marinna (E. Edwards).—Soil medium red loam, which has been cropped for forty years—fallow and wheat for the last six years. Mouldboard ploughed 4 inches in June, springtoothed to ploughing depth August, and again in September and February, springtoothed both ways again before sowing; sown with a disc drill in a dry seed-bed, using 60 lb. seed and 56 lb. superphosphate.

Marinna (Stanyer Bros.).—Medium loam soil containing gravel, undulating country; old cultivation land, previous crop wheat. Mouldboard ploughed in August 4 inches deep, harrowed September, springtoothed November and harrowed February; sown with a combine on 5th May, using 60 lb. seed and 84 lb. superphosphate. Seed-bed moist but rather fine.

Eurongilly (S. A. Cooper).—Soil medium red loam derived from granite, old cultivation, that had been under wheat in 1928. Mouldboard ploughed 4½ inches deep in August, springtoothed November, March and April; sown with a combine on 1st May, using 60 lb. seed and 56 lb. superphosphate. Seed-bed moist and in good order.

Dirnaseer (D. A. Adamson).—Soil medium to heavy red loam of basaltic origin, cropped seven to eight years, last crop wheat 1928. Disced 3½ to 4 inches deep in July, springtoothed November and February; sown with a combine on 21st May, with 60 lb. seed and 78 lb. superphosphate. Seed-bed in good condition and moist.

Bribbaree (T. C. West).—Soil heavy basaltic clay loam, paddock cropped for past fifteen years, last wheat crop in 1928. Disced in October 3 to 3½ inches deep and springtoothed November and May; sown with a combine

8th May in good moist seed-bed. Seeding 60 lb. and superphosphate 56 lb. Rain after sowing, followed by a dry spell, compacted the soil to the detriment of the crop.

Quandialla (P. Coelli).—Soil heavy clay loam, old land, last crop wheat in 1928. Mouldboard ploughed in June, springtoothed in October and scarified in January; sown with a combine on 6th and 7th May in a good moist seed-bed. Seeding at rate of 60 lb. and superphosphate 84 lb. Plots fed off till 1st August.

Quandialla (R. Penfold).—Soil self-mulching clay, old cultivation land, previous crop wheat in 1928. Disced in May, scarified twice before harvest and harrowed, scarified in April and harrowed; sown on the 5th and 6th May with a combine, using 60 lb. seed and 84 lb. superphosphate. Seed-bed moist and in good order.

Quandialla (R. Penfold—oat plots).—Soil self-mulching clay, old cultivation land, previous crop wheat in 1929. Scarified in January, again in April and sown on the 6th May with a combine, using 60 lb seed and 56 lb. superphosphate. Seed-bed moist and fair order.

Wheat Variety Trials.

Results this season seem to indicate that yields were to a certain degree controlled by the stage of maturity of the crop at the peak of the dry period in the spring. A difference of a week or a fortnight in a period of sowing produced remarkable discrepancies in yield in the same variety.

Yandilla King was sown at three centres. Its performance at Bribbareo was disappointing, while at both Bribbaree and Dirnaseer it displayed a degree of shedding that has never been common to the variety. This, undoubtedly, was due to the peculiar seasonal conditions, which led to a haying off rather than a normal ripening. In all plots the straw strength of this variety was very satisfactory, and it showed a measure of resistance to disease.

Bobin yielded well and this variety is deserving of immediate trial by farmers as an early maturer. It stood up well, stripped nicely and yielded a good sample of grain, having suffered little from weather damage.

Waratah gave a satisfactory performance, the sample of grain being particularly good in view of the amount of rain experienced during harvesting. It appeared to suffer slightly from frosting at Quandialla. Losses were experienced with this variety due to shedding. A slight weakness of straw was in evidence at Marinna.

Ford is certainly deserving of further trial on its performance this year.

Free Gallipoli gave a very disappointing performance on one set of plots at Quandialla, but at other centres acquitted itself satisfactorily and deserves further trial, particularly in the most favoured parts of the district.

Nabawa on account of its flag smut resistance and general performance throughout the district has won a definite place in cropping practice.

Duchess yielded well and is certainly worthy of further trial in the district.

Union gave very unsatisfactory results, but requires good winter rains for best yields. Its susceptibility to flag smut is most marked.

YIELDS of Wheat Variety Trials.

Variety.	Bribbaree		Quandialla (P. Coelli.)		Quandialla (R. Penfold.)		Dirnaseer.		Marinna	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Bena	...		...		...		...		20	43
Baroota Wonder	...		...		...		...		18	28
Bobin	...		...		27	31	...		24	53
Cadia	15	2	...		...		...		...	
Carinda	13	47	...		...		...		...	
Duchess	30	36	...		...		19	34	...	
Exquisite	...		32	51	...		...		...	
Ford	30	16	...		...		...		24	7
Free Gallipoli	..		30	48	12	22	...		24	12
Marshall's No. 3	...		28	58	..		18	18	...	
Nabawa	...		...		24	1	...		16	45
Penny	20	42	31	19	...		12	58	...	
Ranee	...		25	21	...		...		...	
Turvey	...		..		...		12	48	...	
Union	..		24	5	...		..		...	
Wandilla	16	23	...		..		24	4	...	
Waratah	...		...		12	46	...		24	28
Yandilla King	17	2	30	3	...		19	6	...	

Wheat Diseases.

All varieties with the exception of Nabawa showed flag smut infection. Wandilla, Yandilla King and Exquisite exhibited a slight resistance, but Bena, Free Gallipoli, Waratah, Ranee, Union, Turvey and Bobin showed varying degrees of infection.

Bunt was absent from all plots, clearly proving the effectiveness of the dry copper carbonate treatment.

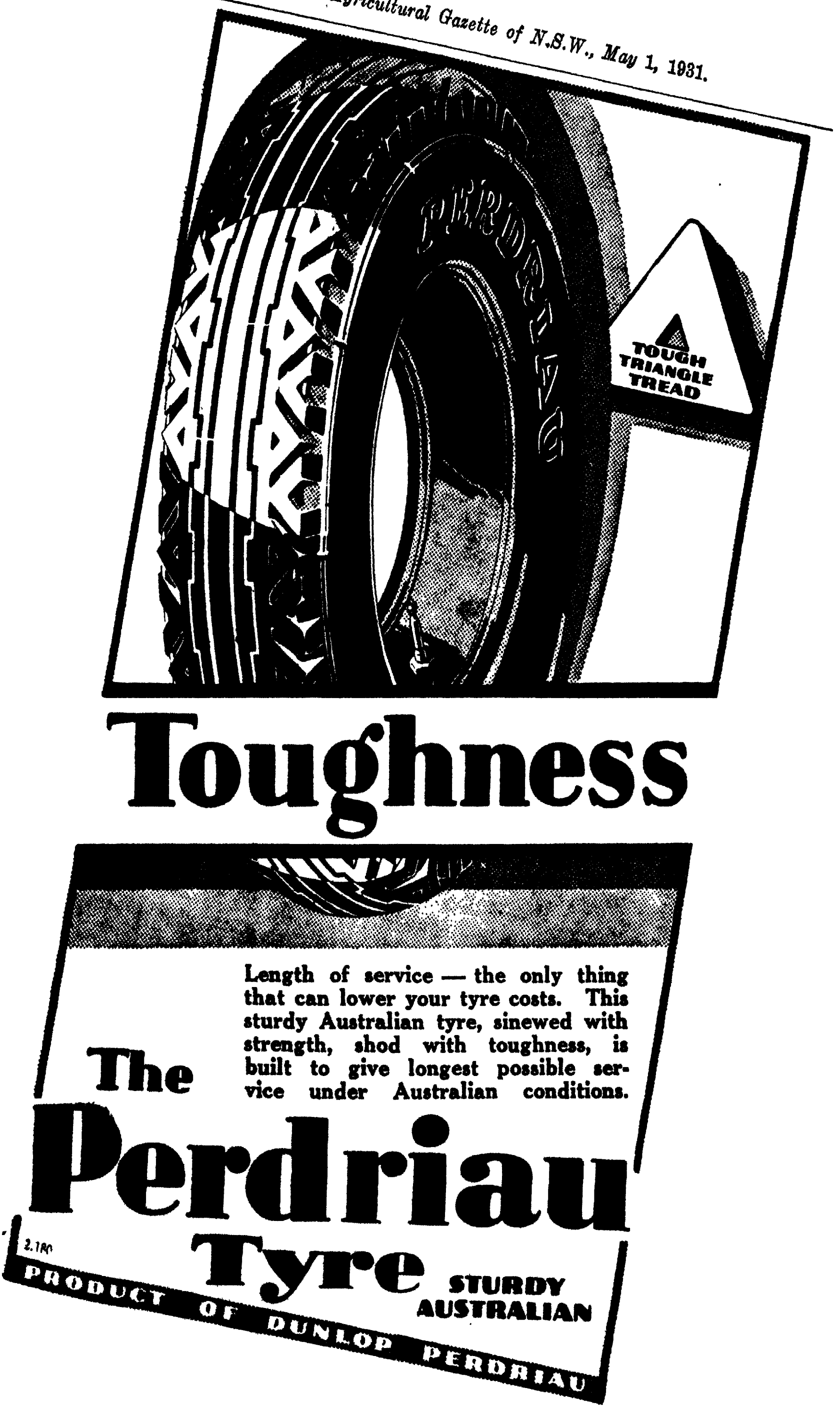
Rust was in evidence, but only to a very minor degree.

Fertiliser Trials with Wheat.

Varying amounts of superphosphate, and gypsum at the rate of 1 cwt. per acre, were under trial for comparative results.

Generally speaking, 84 lb. superphosphate per acre proved the most economical application, although the season was not such as would favour good results from heavier applications.

On the self-mulching clay soil at Quandialla, 56 lb. superphosphate showed up best, while at Dirnaseer pinching of the grain was more noticeable in the 1 cwt.-per-acre plot than in the other two plots. The 56 lb.-per-acre plot at this centre gave the best graded sample of grain.



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RESULTS of Wheat Fertiliser Trials.

Fertiliser per acre.	Bribbaree. (C West.)	Quandialla (P Coelli)	Dirnaseer (D Adamson.)	Quandialla (R Penfold)	Marinna. (Stanyer Bros.)
	Yandilla King.	Yandilla King	Yandilla King	Waratah.	Waratah
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
1 cwt. Superphosphate	19 3	30 6	16 20	13 4	......
84 lb. ,, ...	16 48	30 3	19 6	12 46	24 28
56 lb. ,, ...	17 2	25 9	18 55	13 49	21 6
1 cwt. Gypsum ...	.. ...	21 41	. ....	... .	......

Oat Variety Trials.

Belar was outstanding in all cases for its strength of straw, which is one of the valuable characteristics of this variety. It displayed excellent hay qualities and yielded remarkably well for grain at all centres. It may be classed as an excellent dual-purpose variety for this district.

Mulga displayed a good measure of drought resistance at Quandialla, but the characteristic weakness of straw was evident on all plots. Not only did it lodge, but showed a tendency to break off at both Marinna and Eurongilly.

Gidgee.—The performance of Gidgee at Marinna was highly satisfactory and this early maturer is deserving of further trial. Its excellent hay qualities and greater strength of straw make it a worthy rival to Mulga.

Palestine failed to germinate as well as other varieties, due no doubt to the seed used. Its poor performance at Eurongilly can be largely attributed to germination trouble and to the impossibility of harvesting at the same time as other plots, due to the green growth of wild oats in the ripe crop.

Guyra gave good all round performances at all centres.

YIELDS of Oat Variety Trials.

Variety.	Marinna	Eurongilly	Quandialla
	bus. lb.	bus lb.	bus. lb.
Belar	37 20	51 35	50 36
Guyra	38 31	45 6	55 17
Gidgee	39 4	......	......
Mulga	30 28	38 14	59 27
Palestine	......	23 36	60 0

Fertiliser Trials with Oats.

In these trials, which afford a valuable guide for the district, an application of 56 lb. superphosphate gave phenomenal increases in yield as compared with the unmanured plots. The M17 fertiliser mixture consists of two parts superphosphate and one part sulphate of ammonia.

YIELDS of Oat Manurial Trial.

	M17 mixture. (90 lb. per acre).	Superphosphate (56 lb. per acre.)	No manure.
	bus. lb.	bus. lb.	bus. lb.
Marinna	28 36	30 28	14 12
Eurongilly	32 28	38 14	19 33

Note.—Mulga was the variety used in this trial.

Northern District.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

During the past season variety, depth of cultivation, rate of seeding, fertiliser, time of sowing, and lucerne cover crop experiments were conducted with wheat, variety and manurial trials with oats, and a variety trial with barley on farmers' experiment plots.

The Season.

A description of the seasonal conditions in this part of the State appeared on page 9 of the January issue of the *Gazette* in connection with the wheat crop-growing competitions.

The following table shows the rainfall for the fallow and growing period at a number of centres in the district:—

RAINFALL Table.

	Stangers.	Currabubula (I. Thornton.)	Calala.	Currabubula. (J. & D Scott.)	Duri.	Garthowan.	Somerton	Currabubula. (W. R. Donaldson.)	Rushes Creek	Manilla.	Quirindi.	Warrah Creek.
Fallow Period—1929.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
May	58	...	...	...	...	...	...	...	...	...	...	...
June ...	19	...	...	...	...	...	...	...	...	...	...	...
July	58	...	...	...	...	...	...	...	...	...	...	...
August ...	264	...	...	...	...	...	...	...	...	...	...	...
September ...	175	...	...	...	...	...	...	...	...	...	...	...
October ...	59	...	...	...	...	...	...	...	...	...	...	...
November ...	240	35	...	...	...	...	...	...	...	...	...	...
December ...	69	56	...	...	...	...	...	...	...	...	...	...
1930.												
January ...	251	305	219	...	...	...	...	...	183	...	232	260
February ...	71	34	82	...	89	...	...	15	25	28	152	...
March ...	220	45	376	...	151	255	296	167	150	265	95	80
Growing Period—												
April... ...	157	134	122	...	159	126	153	83	119	79	95	40
May	107	54	70	90	148	210	49	61	117	103	38	100
June ...	524	533	557	474	427	527	534	303	532	423	424	457
July	246	149	200	185	199	141	154	200	143	207	257	300
August ...	72	64	93	64	142	94	59	96	118	62	54	87
September ...	77	98	93	98	87	93	90	87	115	97	91	85
October ...	465	240	400	240	259	400	296	300	353	517	506	502
November ...	...	...	...	...	...	...	...	...	...	...	...	107

Cultural Details.

Manilla (J. R. Heywood).—Wheat variety trial: Soil, red-brown, medium, from shale; old cultivation; mouldboard ploughed 4 to 5 inches 29th January, combined 3 inches 1st April; sown 11th April, seed 60 lb. per acre.

Depth of ploughing trial: Mouldboard ploughed 4 to 5 inches 29th January; portion mouldboard ploughed 6 inches and portion 3 inches 24th March; both combined 3 inches 10th April; sown 12th April; variety, Waratah. The yields were:—

6-inch ploughing	15½ bushels per acre.
3-inch ploughing	13 ,, ,,

Manilla (W. Bignall).—A rate of seeding test with wheat was commenced, but was abandoned, the yields not being considered comparable.

Rushes Creek (W. C. B. Proudfoot).—Wheat fertiliser trial: Soil, grey to light-red, containing shale; mouldboard ploughed 4 inches early January, combined 4 inches 25th February; combine sown 2-5th May, seed 60 lb.; variety, Waratah.

Depth of cultivation trial: Mouldboard ploughed early January; portion mouldboard ploughed 6-8 inches, and the other portion combined 4 inches 25th February; combine sown, seed 60 lb. superphosphate 50 lb. per acre; variety, Bena. The yields were:—

6 to 8 inch ploughing	15 bushels per acre.
4-inch combining	14½ ,, ,,

Gowrie (E. J. Hough).—Wheat fertiliser and method of lucerne establishment experiments. Soil, light-red to brown, self-mulching; old cultivation; mouldboard ploughed 4 to 5 inches January, harrowed early February, combined 3 inches April; sown with a combine 13th May, wheat 50 lb. seed, lucerne 1½ and 2½ lb. seed per acre.

Currabubula (T. and D. Scott).—Wheat variety trial: Soil, red, medium, from basalt; mouldboard ploughed 3½ to 4 inches 2nd May, harrowed 10th May; combine sown, seed 45 lb. per acre.

Duri (V. Reading).—Wheat variety trial; soil, red-brown, setting to self-mulching, from basalt and shale; old cultivation; pasture since 1914; mouldboard ploughed 3½ to 4 inches 4th February, harrowed 6th March; combine sown, seed 55 lb. per acre. Sheeped 25th May to 1st June.

Duri (R. Darling).—Wheat variety trial: Soil, red, setting to self-mulching, from shale and basalt; old cultivation; disced 4 inches 20th February; combined 4 inches 12th March, harrowed 18th March, combined 2½ inches 29th April; combine sown 8-13th May, seed 52 lb. per acre.

Garthowan (R. T. Abra).—Wheat variety and lucerne establishment experiments: Soil, red, medium, part setting; cropped for two previous years; mouldboard ploughed 4 inches 12th February, springtoothed 3 inches

3rd April, combine sown 1st May; wheat sown separately 45 lb. per acre, then in lucerne trial, lucerne, 1½ lb. per acre, mixed with superphosphate and sown over.

Kootingal (J. F. Barber).—Time of sowing wheat experiment: Soil, red, very light, medium setting, from granite; old cultivation; disc ploughed 3 inches mid-December, again 4½ inches mid-February; combine sown, seed 60 lb. per acre, superphosphate 56 lb.; variety, Currawa. Two seedings were made, viz., 16th March and 8th April; grazed until 13th June. Frosts in spring blighted the grain over the whole field and only 9 bushels per acre were harvested.

Currabubula (I. Thornton).—Rate of seeding wheat experiment: Soil, old sedimentary, medium; old cultivation, oats 1929: mouldboard ploughed 4 inches early November, harrowed early March, [illegible] April; combine sown 12th May, seed at 30 lb., 46 lb., and 61 lb. per acre; variety, Nabawa. Sheeped till mid-June. The yields were:—

Seed per acre.	Yield. bus. lb.
30 lb.	27½
46 lb.	27½
61 lb.	33¼

Bective (R. J. Hooper).—Variety trials with wheat and barley: Soil, medium, red to grey, part setting, part self-mulching.

Wheat section; previously pasture; mouldboard ploughed 3 to 4 inches August-September, harrowed and cross harrowed October, cultivated 3 inches early February; sown 4th June, seed 54 lb. per acre, unfertilised.

Barley section; old cultivation; mouldboard ploughed 3½ inches late January, harrowed February; sown 3rd June, seed 52 lb. per acre, unfertilised. The yields of barley were:—

Variety.	Yield. bus.
Pryor	28
Cape	25
Trabut	22

Currabubula (W. B. Donaldson).—Wheat variety and lucerne establishment trials: Soil, heavy black, self-mulching, from basalt; old cultivation; mouldboard ploughed 3 to 4 inches mid-February, harrowed 20th March, springtoothed late March, disc cultivated 17th April; wheat, hoe drill sown 21st April, 45 lb. seed per acre; lucerne broadcasted 24th April, 3 1/5th lb. per acre, and trodden in by sheep; unfertilised. Fed off last week June.

Calala (G. H. Dunn).—Variety and fertiliser trials with wheat and oats: Soil, red, medium, part self-mulching; old cultivation, oats, 1929, fed off; mouldboard ploughed 4 inches January, springtoothed 3 inches early February, harrowed after rain 22nd March, springtoothed 3 inches 17th

April; combine sown and drag harrowed 29th-30th April; wheat 60 lb. seed, oats 40 lb. seed per acre; variety trials not fertilised. Fed off May to 16th June.

The yields in the oat variety trial were:—

Variety.	Yield. bus.
Algerian	19½
Guyra	46
Mulga	37½

Gowrie (Wake Bros.).—Long season wheat variety trial: Soil, medium-heavy, red, self-mulching; 1929 crop failed; mouldboard ploughed 3 to 4 inches early January; combined 3 inches before rain 16th March; combine but was [illegible] April; seed 50 lb. per acre.

[illegible] Adams).—Oat variety trial: Soil, from shale, mostly runs together after rain; cropped for several years; shallow ploughed 3½ inches May, 1929, springtoothed 3½ inches January and harrowed, springtoothed 3 inches shortly before combine sowing on 28th March, seed 43 lb. per acre. The yields were:—

Variety.	Yield per acre. bus.
Algerian	21
Guyra	22
Belar	19
Lachlan	13

Loomberah (W. H. Lye).—Oat variety trial: October rains caused rank growth to 5 feet high, resulting in severe lodging and the loss of most of these crops.

Oxley (Forge and Sons).—Wheat variety trial: Soil, red, medium, setting to self-mulching; grass in 1927-28; disc ploughed 4 inches 21st February, 1930, harrowed March, combine sown 15th April, seed 58 lb., superphosphate 57 lb. per acre. Fed off lightly in July.

Loomberah (G. Tongue).—Depth of cultivation experiment: Soil, mainly brown self-mulching, remainder light red, setting type; old cultivation; oats 1929; portion mouldboard ploughed 5 inches early January, and the other portion springtoothed 2½ to 3 inches, both combined 8th May; combine sown 12-14th May, seed 60 lb., unfertilised; variety Canberra. Fed off 15-18th July. The yields were:—

5-inch ploughing	17 bushels per acre.
2½ to 3 inch springtoothing	17 bushels per acre.

Manilla (W. Bomen).—Time of sowing wheat experiment: Soil, red, medium, from shale, sets down; barley and oats in 1928; mouldboard ploughed 4 inches 31st January, harrowed 20th March; combine sown, seed 45 lb. superphosphate 56 lb. per acre on 14th April, 5th June, and 11th July; variety Aussie. Stem rust severely attacked the second and third sowing and practically destroyed the crops. The yield from the first sowing was 18½ bushels per acre.

Somerton (Messrs. Norris and Venness).—Wheat and oat variety trials: Soil, red, medium, from shale and basalt; wheat 1929; disc ploughed 3 to 4 inches 23rd March, harrowed a week later; combine sown, wheat 48-52 lb. per acre, oats 40-50 lb. per acre; unfertilised.

Warrah Creek (R. Winnett).—Oat variety trial: October rains caused dense growth 5 to 6 feet high, and high velocity winds caused severe lodging.

Warrah Creek (W. Smith).—Wheat variety trial: Soil, red medium heavy self-mulching loam; combined 3 inches 28th January, mouldboard ploughed 4 inches 12th February; combine sown 9th June, seed 53 lb. per acre, unfertilised. Fed off until 23rd July.

Yields of Wheat Variety Trials.

—	Calala	Gowrie.	Bective	Warrah (Smith).	Garthowan	Currabubula (Scott Br.).	Duri (Reading).	Duri (Darling)	Manilla.	Quirindi (Pollock).	Oxley.
	bus.	bus.	bus.	bus.	bus.	bus.	bus	bus.	bus.	bus.	bus.
Marshall's No. 3	16	...	...	...	...	...	...	...	...	...	2
Gallipoli	15	...	...	...	...	...	...	...	...	...	...
Rajah	21	...	...	23	...	...	...	...	...	...	...
Duri	18	...	...	...	...	...	...	...	...	...	...
Federation	16	...	...	...	...	...	...	...	...	...	...
Florence	36	...	...	...	...	...	...	...	...	...	...
Turvey	...	...	...	...	...	...	17	...	...	...	...
Exquisite	...	...	...	...	...	...	...	...	...	...	...
Penny	...	...	...	...	...	...	...	...	...	...	...
Canimbla	...	19	...	...	...	...	26	...	...	...	...
Bobin	...	...	23	...	...	27	...	...	13	7	...
Waratah	...	...	26	...	...	28	...	20	11	22	...
Gullen	...	...	34	...	...	...	...	...	...	...	...
Canberra	...	...	33	...	...	...	...	18	...	16	...
Grosley	...	...	23	...	...	...	...	...	12	...	...
Pusa No. 4	...	...	36	...	...	30	...	...	...	...	...
Baroota Wonder	...	...	23	16	...	...	...	...	...	...	...
Nabawa	...	...	...	36	27	...	...	...	14	...	...
Bredbo	...	...	...	24	...	...	...	...	...	...	...
Ford	...	...	...	...	24	...	...	...	...	...	...
Improved Steinwedel	...	...	...	...	14	...	...	...	...	...	...
Onas	...	...	...	...	15	...	...	...	...	...	...
Ranee	...	...	...	...	...	33	...	...	10	...	...
Aussie	...	...	...	...	...	31	...	20	...	...	...
Hard Federation	...	...	...	...	...	29	...	...	...	...	...
Riverina	...	...	...	...	...	28	...	22	...	20	...
Wandilla	...	...	...	...	...	33	17	...	...	...	...
Yandilla King	...	...	...	...	...	...	23	...	...	...	...
Currawa	...	...	...	...	...	...	20	...	...	...	7
Geeralying	...	...	...	...	...	...	...	22	...	...	...
Bald Early	...	...	...	...	...	...	...	15	...	...	...
Bena	...	...	...	...	...	...	...	...	...	12	...
Cadia	...	...	...	...	...	...	...	...	...	...	0½
Carinda	...	...	...	...	...	...	...	...	...	...	4

YIELDS of Wheat Manurial Trials.

Fertiliser per Acre	Gowrie (E. J. Hough) Variety Aussie.		Calala. Variety, Florence	Rushes Creek. Variety, Waratah.
	With Lucerne	Without Lucerne		
	bus.	bus.	bus.	bus.
Superphosphate, 43 lb.	...	...	...	16¾
" 45 lb.	...	..	29	...
" 64 lb.	...	.	...	15¼
" 66 lb.	..	23	..	...
" 71 lb.	...	...	30½	...
" 73 lb.	...	...	...	20
" 80 lb.	23¼	...	...	...
Lime, 126 lb.	...	..	...	14¾
Basic superphosphate, 49 lb.	..	...	...	15½
Gypsum, 139 lb.	..	...	...	14¾
* M. 16, 60 lb.	..	...	..	15
† M. 30, 82 lb.		...	...	18
‡ M. 23, 67 lb.	...	...	...	17
No manure	..	17¼	26	13

* M. 16 contains ten parts superphosphate and three parts sulphate of ammonia.

† M. 23 contains ten parts superphosphate and three parts sulphate of potash.

‡ M. 30 contains ten parts superphosphate, three parts sulphate of potash and three parts sulphate of ammonia.

Rate of seeding test with wheat: Cultural details as in variety trial; variety Riverina. The yields were:—

Rate of Seeding.	Yield.
	bus.
36 lb.	18¼
53 lb.	20¼
64 lb.	19

Quirindi (Smith-Pollock).—Wheat variety and rate of seeding trials: Soil, deep, medium, grey, old sedimentary; old cultivation; one-way disced 5-6 inches 1st January, harrowed February after rain, rigid tyned 5 inches late February; combine sown 30th April; seed, 50 lb. per acre in the variety trial, and 38 lb., 50 lb., and 61 lb. of Riverina in the rate of seeding trial, unfertilised. Fed off during July. The yields in the rate of seeding trial were:—

Rate of Seeding.	Yield.
	bus.
38 lb.	16½
50 lb.	20
61 lb.	20½

Quirindi (M. Greenwood).—Time of sowing wheat experiment: Soil, light red, medium; old sedimentary; oats 1929, fed off; rigid tyned 3 inches late January, again 3½ to 4 inches 29th March; combine sown 13th June and 23rd July, seed 45 lb. per acre, unfertilised; variety Duri. First sowing fed off 25th June to 20th July, and yielded 27½ bushels per acre. Stem rust very prevalent and the second sowing yielded only bran husk.

Wheat Diseases.

Stem rust was most destructive to those varieties which matured later than early November. Those varieties highly resistant or escaping in order of merit were Ford, Clarendon, Canimbla, Nabawa, Currawa, Aussie, and Florence.

Flag smut was more prevalent on crops on soils that set down, and generally was very light in crops on red, self-mulching soils. Varieties highly resistant or escaping were Nabawa, Ford, Geeralying, Wandilla, Riverina, Currawa, Pusa No. 4, and Florence.

Some frost damage to grain and straw was noted, though where hills occurred to the east of the crop, delaying the sun's rays, little or no damage resulted.

Establishing Lucerne with Wheat Experiment.

Sowing lucerne with wheat at Gowrie produced a good stand of lucerne, and did not reduce the yield of wheat, and the lucerne sown with wheat at Currabubula, grew up to 15 inches high by the time the wheat matured. At Garthowan, a satisfactory stand was established by the same method

RE-NAMING OF SORGHUM VARIETIES.

IT has been found necessary to re-name the sorghum varieties known in this country as Collier and Sumac. These two sorghums were incorrectly labelled when first introduced from abroad. In future what is now called Collier will be known as Sumac, while the variety originally introduced as Sumac, but which has since been developed and improved at Bathurst Experiment Farm, will be re-named Oxley.—J. N. WHITTET, Agrostologist.

POISONOUS PROPERTIES OF "WHITE CEDAR" (*Melia azedarach*).

THE poisonous properties of "White Cedar," particularly for pigs and poultry, which frequently have access to this tree, have been the subject of much controversy in the past.

Investigations undertaken as far back as 1920 at Hawkesbury Agricultural College and later (in 1927) at Glenfield Veterinary Research Station proved that half a pound of the green berries was toxic for a pig. More recent investigations, however, have demonstrated that as little as 4½ oz. of ripe berries are toxic for a pig weighing 44 lb.

Although the toxicity of "White Cedar" for fowls has not yet been investigated in this country, poultry-keepers should be guided by the results of South African investigations, which showed that the most toxic part of the tree was the ripe berry, the flowers, green drupe and bark being less toxic, and that pigs and sheep were most readily poisoned, fowls, muscovy ducks, and goats being less affected. In addition, the South African investigations proved that the only toxic part of the drupe was the soft, yellowish rind (epicarp), the shell and kernel being quite harmless.

Fumigation of Seed Maize.

W. H. DARRAGH, B.Sc.Agr., Assistant Plant Breeder.

FUMIGATION of seed maize and subsequent storage in insect-proof tins are considered essential to preserve it from weevil injury on the north coast of New South Wales. Carbon bisulphide is the fumigant generally used, 5 lb. per 1,000 cubic feet being usually sufficient, though stronger doses are often given.

When maize is harvested it usually contains too much moisture for shelling and for safe storage as shelled grain, but as weevils may be present on the ear, and the grain already infested, it may be necessary to treat it at this stage to prevent further injury when it is being held for seed purposes. While seed maize contains a high percentage of moisture, it is best kept on the ear, as it dries more quickly and safely in this way. Since it is sometimes necessary to fumigate seed maize of high moisture content, and since trouble has often been experienced with the germination of seed after such fumigation, the writer conducted some simple tests during the past season to determine the safety or otherwise of the practice.

Samples of seed maize of different moisture contents, viz., 28.4, 21.6, 19.6, 16.0, and 12.5 per cent. were taken at different periods from the same original source, viz., a shed of Fitzroy maize harvested in July at Grafton Experiment Farm. These samples were fumigated at different temperatures, at different rates and for different periods of time, namely, twenty-four, forty-eight, seventy-two, and ninety-six hours, while germination was compared with that of seed held for similar periods in a closed tin without fumigation treatment.

In addition to testing with the usual dosage strength, a series of tests was made with double this strength, viz., 10 lb. carbon bisulphide per 1,000 cubic feet.

To determine the effect of fumigating at a higher temperature, one series of samples was kept in the glasshouse where the average temperature was 79 deg. Fahr., *i.e.*, 15 deg. Fahr. higher than the average room temperature (64 deg. Fahr.).

Owing to the small quantity of seed used in these tests, only general conclusions can be drawn at present, but these are sufficient to indicate that there is some danger in fumigating seed maize under certain conditions, and they may pave the way to more comprehensive and more conclusive tests.

The results of the trials indicate that practically no loss in germination followed when the seed was held without treatment in a closed tin for any period up to ninety-six hours, even in the case of the sample with the highest moisture content.

At an average temperature of 64 deg. Fahr. and using a normal dosage (viz. 5 lb. carbon bisulphide per 1,000 cubic feet) fumigation of seed maize with a high moisture content for twenty-four to seventy-two hours does not appear to be harmful to germination, but an appreciable drop in germination was observed when the seed was fumigated for ninety-six hours, except when the seed is thoroughly air dry (12.5 per cent. moisture content).

With a stronger dose (viz., 10 lb. carbon bisulphide per 1,000 cubic feet) at the same temperature, fumigation for a period longer than twenty-four hours was very harmful to germination, except for thoroughly air-dry seed. Even at the higher average temperature, viz, 79 deg. Fahr., no deleterious effect on germination was observed when the seed was kept in a closed tin up to ninety-six hours with any treatment, even when the seed contained 28.4 per cent. moisture. It is felt that there is, however, some risk involved in this procedure, which is never necessary nor advisable for fumigation purposes. At this temperature, fumigation at the usual strength appreciably reduced germination, except when the seed was thoroughly air dry, and the drop in viability was very marked for such fumigation for a period of forty-eight hours or more.

With the stronger dosage at the higher temperature the deleterious effect on the germinating power of the seed was much more marked, complete failure occurring at the highest moisture content and for the periods prolonged beyond twenty-four hours, though again no loss in germination was suffered with this stronger dosage and higher temperature when fumigated for ninety-six hours, provided the seed was thoroughly air dry. It is not known for what period thoroughly air-dry seed can be safely fumigated, but it should never be necessary to prolong the period beyond ninety-six hours. It was observed, however, that fumigation of any seed maize beyond a period of forty-eight hours weakened the vitality of the seed. Even where the viability or germination was satisfactory there was a distinct weakness of growth in many of the seedlings from seed fumigated for more than forty-eight hours.

From the foregoing it is recommended that if maize containing a high percentage of moisture must be fumigated, nothing stronger than the ordinary dosage of carbon bisulphide (5 lb. per 1,000 cubic feet) should be employed for not more than forty eight hours, preferably on a cool day or over-night. Fumigation should be followed by thorough aeration of the seed.

INFECTIOUS DISEASES REPORTED IN MARCH.

THE following outbreaks of the more important infectious diseases were reported during the month of March, 1931 :—

Anthrax	**1**
Blackleg	**3**
Piroplasmosis (tick fever)	**Nil.**
Pleuro-pneumonia contagiosa	**3**
Swine fever	**Nil.**
Contagious pneumonia	**2**
Necrotic enteritis	**1**

—MAX HENRY, Chief Veterinary Surgeon

The Snake Bean.

SUITABLE FOR DRY WESTERN DISTRICTS.

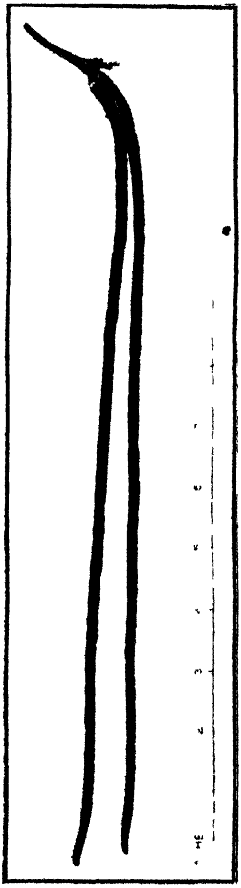
J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

IN the dry areas of the west vegetable growing in the summer calls for the greatest skill. Even where irrigation is practised, many difficulties arise that are not to be met with in other districts. The dry heat experienced day and night is the cause of most of the trouble.

Beans, a summer crop that is easily produced in most parts of the State, are difficult to grow in the dry western districts, as far as pod production is concerned It is found that December and January plantings are failures in this respect, owing to the fact that the hot winds destroy the pollen, thus preventing the pods from setting. Earlier or later planted beans (providing they miss the frost) are more successful, the lower temperatures permitting pollination.

Many varieties have been tried, but with only partial success, though the occurrence of a few dull days may enable certain flowers to set. Generally speaking, the dwarf varieties are a failure. The well known climbing types, again, do not set well, and very rapidly produce abundance of seed in the pods at the expense of flesh. The writer recently came across a selected climbing type, however, that is more than a novelty, and fills the requirements of western growers with respect to the difficulty discussed.

This variety is commonly called the Snake bean. It is a most prolific grower and cropper, producing pods over a long period. The beans are usually 18 inches in length, individual beans measuring up to 30 inches having been grown on the coast. If pulled before the seed forms the bean will be found to be stringless, very fleshy, and of sweet flavour. The pods are borne in pairs on a flower stalk. As soon as two beans are pulled two more flowers are formed on the same stalk. Unfortunately the Snake bean is a late maturing variety. It is, therefore, unsuitable for planting after Christmas. Very early plantings are also unsuccessful as the cold soil does not encourage good growth. The best results



Snake Bean.
A useful variety for western districts.

are obtained when the plantings are made after the soil has warmed up in the early part of October.

Snake beans are very resistant to anthracnose, rust, and fusarium. This bean has also been known as Mexican and Italian. Though there are several strains, the one under review appears to be the best.

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with the view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected orange buds to nurserymen during the 1930 budding season, trees from which should be available for planting during the 1931 planting season :—

	Buds of Washington Navel.	Buds of Late Valencia.
T. Adamson, Ermington	3,000	3,000
W. Beck, Epping...	1,000	1,000
A. T. Eyles, Rydalmere ...	3,000	2,000
J. de Freitas, Fairfield ...	200	200
R. Hughes, Ermington ...	1,000	1,000
L. P. Rosen and Son, Carlingford	5,000	1,200
B. E. Yarnall, Ourimbah	100	100

— C. G. SAVAGE, Director of Fruit Culture.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1931.

Casino (E. J. Pollock)	May	6, 7
Trangie (F. H. Hayles) ...	,,	19, 20.
Forbes Sheep Show (E. A. Austen)	July	8, 9
Cootamundra Sheep Show (G. B. Black)	,,	21, 22
Young Sheep Show (Thos. A. Tester)	,,	29, 30
Peak Hill (W. Crush)	Aug.	4, 5
Trundle (W. P. Forrest)	,,	18, 19
Lake Cargelligo (C. W. Hutchens)	,,	18, 19
Illabo (J. McCarthy)	,,	19
Condobolin (J. M. Cooney)	,,	25, 26
Ungarie (D. R. Bedford)	,,	26
Wagga (F. H. Croaker) ...	,,	25, 26, 27
West Wyalong (A. Andrew)	Sept.	1, 2
Grenfell (P. Mylecharane)	,,	1, 2
Murrumburrah (W. Worner)	,,	1, 2
Bogan Gate (J. T. A'Beckett) ...	,,	2
Burrowa (S. G. Hughston)	Sept,	3, 4
Barmedman (S. S. Penberthy)	,,	5
Young (Thos. A. Tester)	,,	8, 9
Cowra (E. P. Todhunter)	,,	15, 16
Temora (J. M. McInnes)	,,	15, 16
Forbes (E. A. Austen) ...	,,	15, 16
Junee (G. W. Scrivener)	,,	22, 23
Canowindra (W. E. Frost)	,,	22, 23
Barellan (W. H. McRae)	,,	23
Ardlethan (Les Smith) ...	,,	30
Berrigan (R. Wardrop) ...	,,	30
Hay (G. C. McCracken) ...	Sept.	30, Oct. 1
Narrandera (J. D. Newth)	Oct.	6, 7
Ariah Park (Mort Collings)	,,	7
Quandialla (Stuart Tomkins)	,,	7
Griffith (M. E. Sellin) ...	,,	13, 14
Bribbaree (J. Aston) ...	,,	14
Cootamundra (G. B. Black)	,,	20, 21

ESTABLISHMENT *of* PASTURES

The young plants during root establishment cannot forage to any extent for plant food. It is therefore essential when seeding a pasture to use a balanced mixture of readily available fertiliser. When the clovers become established, they are able to fix their own nitrogen and require phosphate applications only. The grasses, however, become nitrogen starved during the cold months and show little growth unless supplied with this plant food. Consequently, for the production of a good "soil cover," the exclusion of weeds, and a balance between grasses and clovers, newly sown pastures should be fertilised as follows:—

A—IN AUTUMN AT SEEDING—
2 to 3 cwts. super per acre
1 to 2 cwts. sulphate of ammonia per acre.

B—IN JULY—
1 to 1½ cwts. sulphate of ammonia per acre.

Applications of nitrogen will, in addition, provide valuable Winter and early Spring feed.

For further particulars apply

ADVISORY OFFICER,
NITROGEN FERTILISERS PTY. LTD.
360 COLLINS STREET, MELBOURNE, C.I.

M.I.B. FOODS FOR ALL CLASSES OF LIVE STOCK

For Poultry	Throughout Australia **M.I.B. FOODS** have become famous for their egg producing capacity and their virtue in securing quick and sturdy growth in Young Stock.
For Pigs	**M.I.B. FOODS** will prevent cannibalism in Breeding Sows and speed up the maturity in Bacon and Porker Pigs
For Calves	The addition of MEAT CONCENTRATES with Skimmed Milk and the like is as good or better than whole milk for rearing Calves
For Dairy Cows	**M.I.B. BONE PRODUCTS** are rich in calcium phosphates. They aid the milk flow, prolong the lactation period and prevent deficiency diseases.

Write for further particulars to:—

METROPOLITAN MEAT INDUSTRY BOARD
STATE ABATTOIR, HOMEBUSH BAY
via SYDNEY, N.S.W.

Varieties of Wheat in New South Wales.

[Continued from page 268.]

J. T. PRIDHAM, Plant Breeder, and A. R. CALLAGHAN, D.Phil., B.Sc., B.Sc.Agr., Assistant Plant Breeder.

SINCE the first instalment of this article appeared in the December, 1930, issue of the *Agricultural Gazette,* the following varieties have been described and illustrated:—Waratah, Federation, Yandilla King, Turvey, Canberra, Nabawa, Bena, Marshall's No. 3, Penny, Hard Federation, Union, Free Gallipoli, Nizam, Currawa, Gresley, Wandilla, Ranee, Riverina, Cleveland, Purple Straw, Aussie, Bomen, Major, Gluyas Early, Minister, Bald Early, Florence, and Clarendon.

In each instalment the varieties are dealt with in the order of their relative importance in New South Wales at the time of writing.

Baroota Wonder.

This wheat is a South Australian variety, which originated as a selection from either Budd's Early or Ward's Prolific.

It is early to midseason in maturity, and has straw characters essentially suitable for hay, being tall, slender, and of good quality. The ears are white, long and tapering, distinctly lax, and narrow with conspicuous tip-awns. The outer glumes are long and narrow, with narrow shoulders, predominately round throughout the spike, and with fairly short blunt beaks. The grain is held well, with no tendency to shatter, it is large, soft, usually very pale, and belongs to the weak flour class.

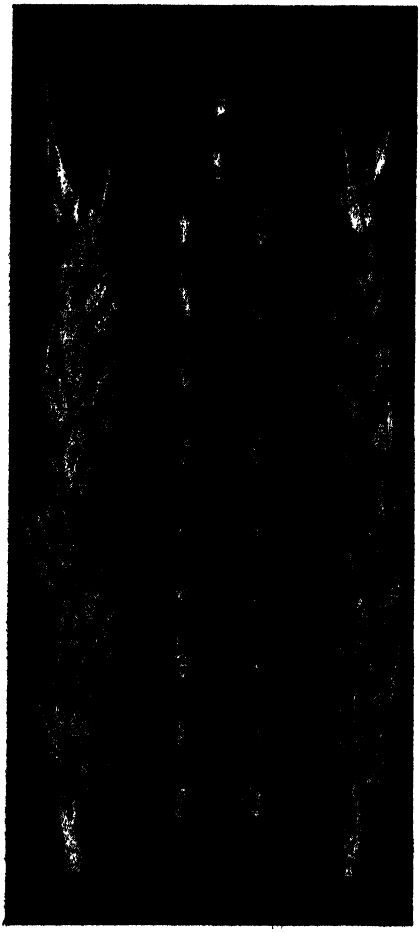
Baroota Wonder shows some resistance to flag smut under field conditions, but it is susceptible to stem rust. It is an excellent hay variety, and in some districts also yields well for grain. It appears in the departmental recommendations for the South-western Slopes and Eastern Riverina, where it is recommended for hay and grain; similarly it is recommended for the dry areas of the Murrumbidgee Irrigation Area.

Rajah.

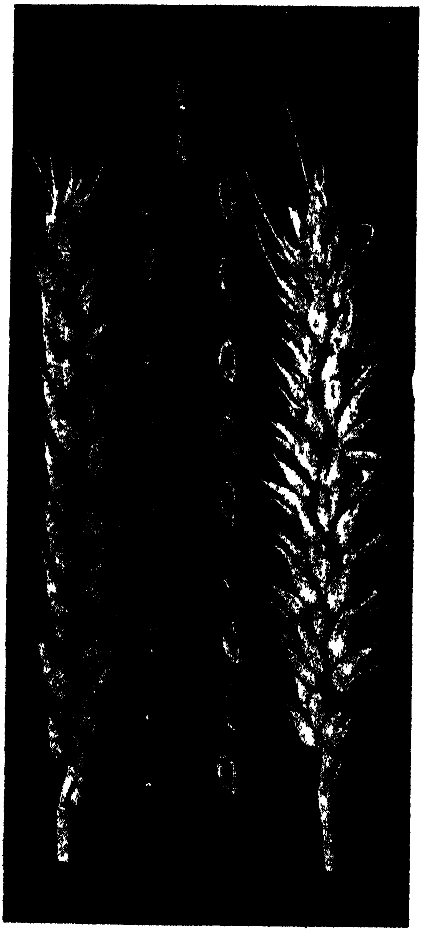
Rajah was produced by the Victorian Department of Agriculture from a cross made between Indian E and Telfords; the latter parent is a very dense-eared wheat of the purple straw type.

It is an erect-growing type with stiff foliage and rather short, stout straw. The ears of Rajah are very dense throughout, rather oblong in shape, bearing very wide spikelets which normally yield three to five grains; they are white and tip-awned, and from general characters alone can be easily recognised from the ears of other varieties. The outer glumes are long with distinctly oblique shoulders on those of the basal spikelets. The grain belongs to the weak-flour class.

Rajah is susceptible to flag smut, though some strains of the variety are thought to be resistant; it is also susceptible to rust. It is an early to mid-season variety that has become popular in Victoria, where it is especially recommended for mallee soils. It does not appear amongst the New South Wales departmental recommendations, but it shows promise of succeeding fairly well under the dry conditions of the western limits of the wheat belt.



Baroota Wonder.



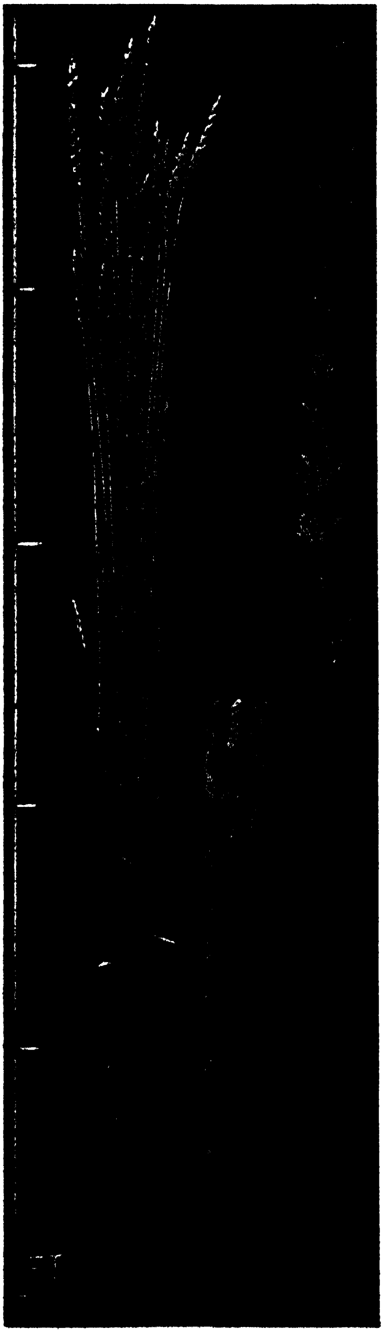
Rajah.

Firbank.

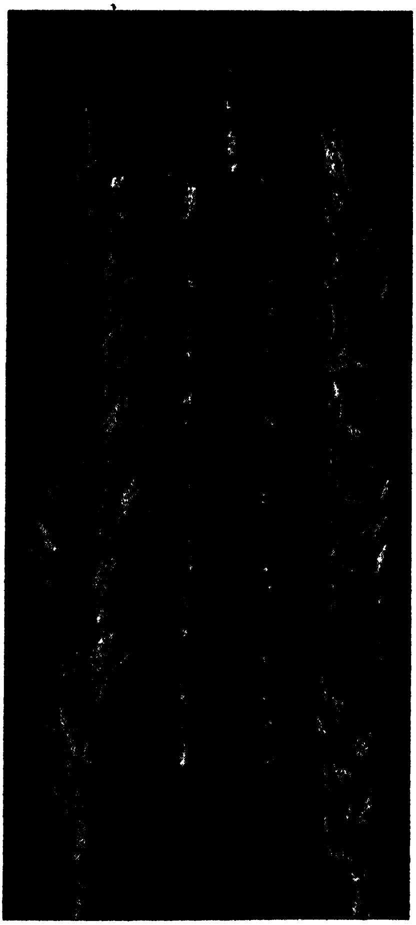
Firbank arose from one of Farrer's crossbreds, Zealand x Maffra. The Maffra parent was also bred by Farrer, from Blount's Lambrigg x Hornblende x King's Jubilee; it was a very early-maturing wheat.

Erect in early growth, Firbank tillers sparsely and is a very early-maturing variety. It has tall, fine straw, reputed to be sweet and palatable to stock, and it is very suitable for hay. The sharply tapering white ears are only very lightly tip-awned, bearing large spikelets, which are characteristically directed in very irregular fashion. The outer glumes are long and narrow, with narrow elevated shoulders. The large white grain is included in the weak-flour class.

Firbank is resistant to flag smut and is rarely seriously attacked by stem rust. On account of its very early maturity, the prime quality of its chaff and its disease resistance, it is useful for sowing tracks and headlands



Firbank.



Cadia.

which are usually harvested for hay before general harvest operations begin. It is included in departmental recommendations for hay on the Western Plains and for green fodder and hay in coastal districts.

Cadia.

Cadia has the pedigree (Cleveland x Talavera) x (Jumbuck x 9F); the cross was made at Lambrigg by Farrer. The variety 9F was a crossbred chiefly of Purple Straw breeding. Cadia resembles the old White Hogan or White Lammas variety, but holds its grain better.

Cadia is a free-stooling, late maturing variety, with tall, white straw suitable for hay-making. The ears are long, white, and tapering with tip-awns, of medium density; the spikelets are fairly compact and regularly directed. The outer glumes are long and rather narrow, with narrow, elevated shoulders. It has medium to large, elliptical grain of a horny nature, which is included in the medium-strong flour class.

Cadia is susceptible to stem rust and highly susceptible to flag smut. On this latter account it will probably not find much favour in the future. At Bathurst Experiment Farm, however, it has yielded slightly better than Cleveland for some years, but its rather late maturity precludes it from districts other than the cooler areas of the State. It is recommended by the Department for grain or hay in Central Tableland districts, and in the cooler districts of the Central-western Slopes of which Coonabarabran is typical.

Duri.

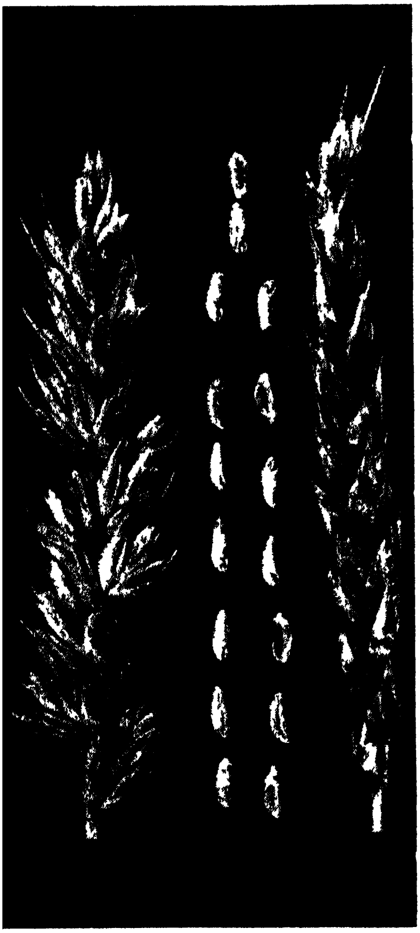
Duri resulted from a cross made at Wagga Experiment Farm in 1917 between the sister wheats Canberra and Forelock. Forelock was used as one parent because of its strong straw, the idea being to obtain a wheat of the Canberra type, but with stronger straw.

This variety has an erect, fairly stiff habit of growth, with short straw of medium strength and fineness. The brown, very short ears of Duri bear tip-awns; the outer glumes are short and wide, with predominately square shoulders, and the spikelets, though fairly compact, are irregularly directed. The ears can be recognised from Canberra on the shoulder characters of the outer glumes (these are elevated in Canberra) and from Waratah in that the tip-awns are not as conspicuous nor have they the typical divergence of those of Waratah, while in addition the spikelets are more compact and less prolific. The grain is classed as medium-strong for milling purposes.

Duri is an early-maturing variety—it comes into ear a few days later than Canberra—and has a tendency to shatter its grain after ripening. It is just as susceptible as Canberra to flag smut, and is also susceptible to stem rust.

This wheat was only distributed to farmers in 1926; since then its area has extended to over 5,000 acres in New South Wales according to the figures for 1929; this increase has been mostly at the expense of Canberra.

It is recommended by the Department as a grain variety on the North and Central-Western Slopes, but it also appears to possess a measure of drought-resistance, and yields very well under the dry conditions of the far western districts.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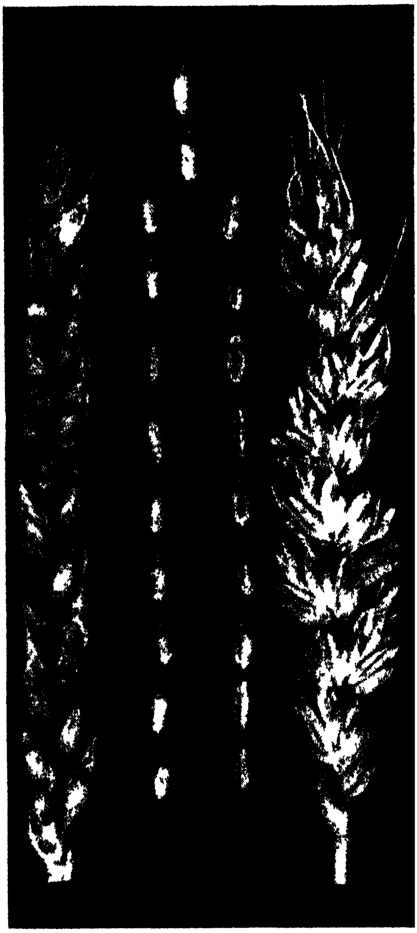
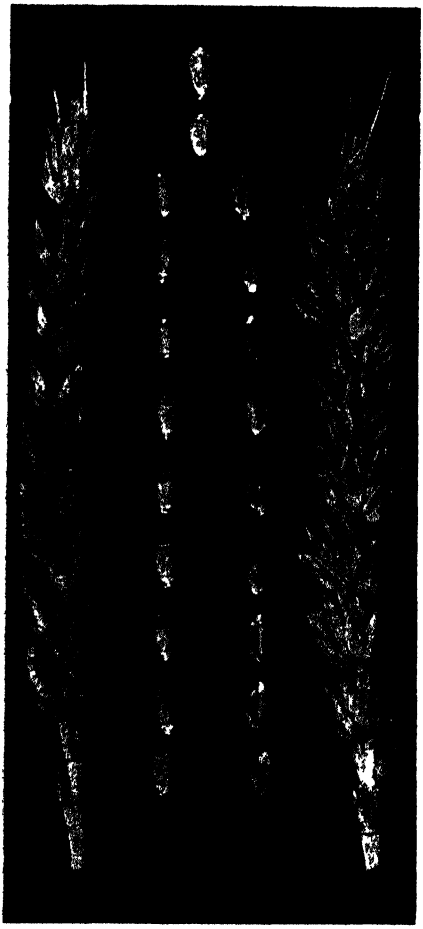

Bobin.

Bobin.

Bobin was bred from the cross Thew x Steinwedel made at Cowra Experiment Farm in 1915, with the object of uniting the high yielding and drought-resistant qualities of Steinwedel with the better grain holding capacity of Thew.

An early to midseason variety, it has medium-stout straw which is strong and does not lodge easily. It has bold, tip-awned ears which are pale brown in colour; they are of medium length, tapering and with the spikelets usually very irregularly directed. The outer glumes are short and wide, with medium-wide shoulders which are elevated throughout the spike. The large opaque grain is classed in the weak flour group.

Although it gives a susceptible reaction to flag smut in infection tests, it appears to be somewhat tolerant under field conditions as its productiveness seldom suffers severely from the disease. It is, however, highly susceptible to stem rust and produces very pinched grain when rusted. For the latter reason it is not suitable for the tablelands or cooler slopes districts. Under dry conditions, however, it has already proved itself distinctly superior to Waratah. Although only distributed a few years ago, nearly 5,000 acres of Bobin were grown in the State in 1929.



Canimbla.

Canimbla.

Canimbla originated from a cross made at Cowra Experiment Farm in 1914, between Hard Federation and Cleveland.

The straw is white, medium-tall, and fairly strong; it is considered rather short for a late-maturing variety. It has pale brown, erect. medium-dense ears which are rather blunt and compact, bearing tip-awns. The outer glumes are short, medium-wide, with broad, very square shoulders, and with blunt, short beaks. The superficial ear characters resemble those of Ranee, but in contrast to those of Canimbla, the outer glumes of Ranee are long, medium-wide, with medium-broad, rounded to square shoulders and with long, sharp beaks. The semi-flinty grain of Canimbla is very attractive; it is small, ovate and hard, and classed in the medium-strong group for milling purpose.

This variety is susceptible to foot-rot and to flag smut, but moderately resistant to stem rust. It is a late-maturing variety suitable for both hay and grain; it has given very satisfactory results at Cowra Experiment Farm, outyielding Yandilla King during seven years' trial.

Wandilla—A Correction.

In the March issue, page 185, it was stated that Wandilla was selected at Cowra Experiment Farm from a cross between Federation and Yandilla King originally made at Wagga Experiment Farm in 1907. It is now apparent that the main work of selection was also done at Wagga Experiment Farm.

THE SUITABILITY OF RAIN-DAMAGED WHEAT FOR SEED.

THE following are the results of germination tests recently carried out under natural field conditions with "shot" and "sprung" wheat grains. The test was also designed to determine the effect of dusting "sprung" and "shot" seed with copper carbonate at the rate of 2 oz. per bushel. "Sprung" grains, it should be explained, are those the germs of which are swollen but the seed coats not ruptured, while with "shot" grains the seed coats are broken as a result of the swelling of the germs:—

	Percentage Germination	
	"Sprung" grains.	"Shot" grains.
	Per cwt.	Per cwt.
Untreated seed	90	83
Treated with Copper Carbonate three days before sowing	86	77
Treated with copper carbonate thirty-one days before sowing	82	60

The results show that the germination capacity of "sprung" grain is impaired and is further slightly reduced as the result of treatment with copper carbonate, while in the case of "shot" grain there is a material reduction in germination, which is still further reduced by the copper carbonate treatment.

Commenting on these results, Mr. H. C. Stening, Chief Instructor of Agriculture, states that in order to obtain a "strike" equivalent to that obtained by sowing a bushel of undamaged seed wheat, it would be necessary to sow 72 lb. of "shot" grain, and if the seed had been treated with copper carbonate a month before sowing, the rate of seeding would have to be increased to 100 lb. per acre. Rarely is wheat so badly damaged that 100 per cent. of the grain is "shot," as in the case of the sample tested, but even if a large proportion of the grain is "shot" it would be preferable not to use it for seed if sound grain is available. In the case of an average weather-damaged sample of seed wheat, containing a proportion of "sprung" and "shot" grains and which has been treated with copper carbonate, an increase in the rate of sowing by about 10 lb. per acre should be sufficient. It is preferable to err in sowing heavily, for if the stand is too thick it can be thinned out by harrowing, whereas it is extremely difficult to improve the density of a stand that is too thin.

Fat Lamb Trials, 1930.

COWRA AND BATHURST EXPERIMENT FARMS.

J. M. COLEMAN, Senior Sheep and Wool Instructor.

TRIALS for the purpose of ascertaining the most suitable cross for the production of fat lambs in the Cowra, Bathurst, and similar favourably situated districts were continued during last season at Cowra and Bathurst Farms.

The Cowra Trials.

Equal numbers of Merino, comeback, and crossbred ewes were mated with Dorset Horn and Ryeland rams. The season, generally, was unfavourable, being so dry during the first part of the year as to make it necessary to hand-feed the ewes until they lambed.

PARTICULARS of Mating.

Mating Period	Breed of Ram	Percentage of Rams	Breed of Ewe	Number.
2-12-29 to 26-2-30 ...	Dorset Horn ...	2½	Merino ...	70
	Dorset Horn ..	2½	Comeback	74
	Dorset Horn ..	2½	Crossbred	73
2-12-29 to 26-2-30 ...	Ryeland	2½	Merino ...	70
	Ryeland	2½	Comeback	74
	Ryeland	2½	Crossbred ..	73

The Lambing.

The lambing commenced among the crossbred ewes on 28th April.

The following table indicates the times at which the different kinds of ewes show the greatest tendencies to mate:—

Breed of Ram.	Approximate Time of Service	Month of Marking	No. of Lambs Marked		
			From Merino Ewes.	From Comeback Ewes.	From Crossbred Ewes.
Dorset Horn ...	December ...	May	49	47	44
	January ...	June ..	3	12	14
	February ..	July	1	2	2
Ryeland	December ...	May ...	35	32	27
	January	June ...	18	20	25
	February	July ...	1	2	6

A feature of these results is that the crossbred ewe is apparently slightly later to mate than the Merino and comeback, whereas in the previous year's trials this breed was considerably later. The 1929 trials showed that with approximately the same number of ewes mated, 154 Merino and comeback ewes lambed during the month of May and only six crossbreds. It is safe to assume that the seasonal conditions were largely responsible; probably a cool spell prevailed at that period. As was the case the previous year, the comeback ewe was very little later than the Merino ewe.

LAMBING Details.

Breed of Ram	Type of Ewe	No of Lambs Mated	Ewes Died Prior to Lambing	Ewes Died During Lambing	Ewes Assisted at Lambing	Lambs Born Dead or Died at Birth	Total No of Lambs Born	Percentage of Lambs Born
Dorset Horn	Merino	70		2	1	2	53	75 7
	Comeback	74		2	.	5	61	82·4
	Crossbred	73		2	1	3	60	82 2
Ryeland	Merino	70		6		6	54	77 1
	Comeback	74		1	2	4	54	72 9
	Crossbred	73		1	1	5	58	79 5

NOTE.—A few lambs died prior to marking among all crosses. Owing to the adverse season and difficulty to get ewes to mother their lambs, it was impossible to note the number of twins born.

The remarkable feature of this year's trials was that very little assistance was needed by the ewes at lambing time; for instance, only 1 Merino, 2 comeback, and 2 crossbred ewes were assisted, whereas the previous year 44 Merino, 1 comeback, and 2 crossbreds needed assistance.

The lambs when born were very small owing to dry conditions then existing, and this no doubt was responsible for the low mortality and small amount of assistance necessary at lambing.

The condition of the ewe and general handling of the flock during the gestation period are largely responsible for successful lambing. Where breeders are mating the British breed rams to Merino ewes, a better lambing would certainly result if the ewes were kept in moderate condition throughout the gestation period. The fact that the lambs, as a drop, may be small when born does not affect their progress and growth, as they will mature quicker and reach the necessary weight at an early age

Market Results.

Unfortunately the lambs could not be marketed owing to the slaughtermen's strike in November, 1930. However, the lambs as a consignment were an excellent lot and would compare favourably with any previous consignments. Those from crossbred ewes were best, closely followed by the comebacks, while the slower maturing Merino lambs were well behind.

Wool Returns.

The wool from the ewes was sold by auction on 7th January, 1931, the Merino fleeces bringing up to 7¼d. lb., comeback to 6d., and crossbred to 5d.

When it was definitely known that the lambs would have to be held, they were shorn, on 1st December, 1930, being then about six months old. The average weight cut from each cross was 4.5 lb. from Dorset Horn x

Merino, 5 lb. from Ryeland x Merino, 4.5 lb. from Dorset Horn x comeback, 5.2 lb. from Ryeland x comeback, 4.6 lb. from Dorset Horn x crossbred, and 5 lb. from Ryeland x crossbred ewe.

The Bathurst Trials.

The trials, wherein Merino ewes were mated with Dorset Horn, Ryeland, and Border Leicester rams, were continued during 1930 at Bathurst Farm. Dry conditions prevailed during the early portion of the year, but the season was good during the growth of the lambs.

PARTICULARS of Mating.

Mating Period.	Breed of Ram.	No. of Rams Used.	Breed of Ewe.	No. of Ewes Mated.
14–12–29 to 30–1–30	Ryeland	2	Merino	55
	Border Leicester ...	2	Merino	55
	Dorset Horn ...	2	Merino	55

The Lambing.

Apart from the extra attention required by the Border Leicester ewes during the lambing period there were no outstanding features. Lambing commenced on 12th May.

DETAILS of Lambing.

Ram.	Ewes.				Lambs.				
	Mated.	Missed.	Died.	Assisted	Born.	Died.	Twins.	Marked.	
								No.	Percentage.
Ryeland	55	8	5	7	45	7	3	38	69·0
Border Leicester ...	55	17	2	13	42	6	6	36	65·5
Dorset Horn ...	55	13	3	7	43	5	4	38	69·0

NOTE.—Fourteen lambs were born dead, and four lambs were killed by the cold.

The previous difficulties experienced with the Ryeland-Merino cross at lambing time were not so evident on this occasion, and the amount of assistance needed with this cross was not nearly so great.

The results of this experiment are not complete owing to the effect of the slaughtermen's strike which prevented the sale of the lambs at Flemington in November. However, when it was ascertained that the lambs could not be sold, they were weighed to give some idea of their progress. The Dorset Horn-Merino lambs averaged 67½ lb., the Ryeland-Merinos 69½ lb., and the Border Leicester-Merinos, 71 lb. As these weights were taken after the export weight had been reached some weeks, the early-maturing Dorset Horn and Ryeland crosses would have passed the peak period and would be losing weight, whereas the later-maturing Border Leicester cross would not have lost bloom and weight to the same extent.

Sheep Lick Trials at Glen Innes.

MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon, and
E. A. ELLIOTT, Sheep and Wool Expert.

BECAUSE of the interest which has been taken in licks for sheep in the New England district, the Manager of the New England Experiment Farm, Glen Innes, suggested that that farm would be a suitable place on which to carry out a series of experiments with a view to determining ultimately what constituents were necessary or desirable in a lick supplied to sheep in that area.

In order to make the trial as comprehensive as possible, the work was placed under the control of the Chief Veterinary Surgeon and the Sheep and Wool Expert, whilst the officers concerned in actually carrying it out were the manager of the experiment farm, who was responsible for the daily supervision, necessary movement and care of stock generally, and the District Veterinary Officer (North), who, either directly or through the Inspector of Stock, Glen Innes, carried out observations on the health of the sheep throughout the trial.

The Licks Tested.

The accommodation at the farm was such that only four flocks of sheep could be handled in the experiment, and as stockowners in the district were keenly interested in the use of a material reported to contain cystine, it was decided to deal with four lots of sheep, which would receive licks as follows:—

(*a*) Salt and proprietary cystine mixture made up in the proportion of 15 lb. of cystine mixture and 25 lb. of salt;

(*b*) a mixture of salt and bonemeal made up at the rate of 13½ lb. bonemeal and 26⅔ lb. of salt;

(*c*) salt to which had been added potassium iodide in solution, made up to the strength of 5 oz. of potassium iodide in solution with 40 lb. salt;

(*d*) no lick at all.

As these quantities may appear to be somewhat arbitrary, it is desired to explain the reasons which led to the adoption of these combinations and these quantities. The proprietary mixture said to contain "cystine" is a preparation manufactured locally, and is a by-product obtained from waste matters at abattoirs. It is specially prepared as being rich in cystine, and the makers claim that it contains 2½ per cent. cystine. (This material was not analysed departmentally.) It had been used by a stockowner in the New England district as being a suitable form in which he could supplement the protein ration of his sheep. The bonemeal used was supplied by the Meat Industry Board, and was similar to that placed on the market by them. It is known that much of the country on the northern coast and the Northern Tablelands is to a varying extent deficient in mineral matter, as is evidenced by the habit of bone-chewing exhibited by cattle in many parts of these districts, and there was some evidence that the supply of an additional amount of phosphorus and calcium to sheep was of benefit in New England.

Potassium iodide was tested because at that particular time there was a very widespread campaign urging the high value of iodine as a supplement to feed for stock. There was very little definite evidence as to whether iodine was necessary or whether it would be of benefit. The quantity selected was purely empirical, as there were practically no figures available at the time from which the optimum amount could be deduced.

Salt was included in all the licks because of the general opinion, which is supported by very considerable experimental evidence, that a supply of sodium chloride over and above that which is found in the ration is necessary for high production. On submitting a sample of the salt used to the Chief Chemist, that officer reported that it contained 6 parts per million of iodine, which is a point of considerable importance in considering the results of the experiment.

The lick quantities were made up on the supposition that the sheep would consume ½ lb. lick per month per sheep, but this expectation was not realised. From 15th April to 17th July, 1929 (when the trial started), the sheep had no lick of any sort.

The Scope of the Trial.

Each lot of sheep consisted of eighty Merino ewes of fairly uniform type, which had been brought from sound country specially for the trial. Each animal was tagged, and arrangements were made for them to be weighed after tagging and again at regular intervals. This weighing was carried out at monthly intervals, except during the first few months and again during very wet weather in the winter of 1930.

The four paddocks provided were made as even as possible. They were bush paddocks which had not received any top-dressing, but were fairly well cleared and improved. At times the ewes were fed on growing crop and on stubble, but every effort was made to ensure that each lot received the same treatment in this regard, and the flocks were changed over from paddock to paddock at fortnightly intervals in order to equalise their food supplies as much as possible. Nevertheless, it cannot be claimed that the sheep did receive exactly identical feed.

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G. D. ROSS, Under Secretary,
Department of Agriculture,
SYDNEY.

Apart from this variation there has also to be taken into consideration the fact that the paddocks which had been sown with crop had also been dressed with superphosphate. Thus one of the paddocks, known as No. 6, was sown with oats in February, 1929, and at the same time dressed with 60 lb. superphosphate per acre; in the pastures which grew between February and June, 1930, there was a large percentage of Wimmera Rye. Paddock No. 15 was fallowed during 1929 after being sown in May, 1928, with oats and dressed with 60 lb. superphosphate per acre. The paddock known as "Beverley Stubble" was sown with oats and dressed with 60 lb. superphosphate per acre in May, 1929, whilst the area known as "The Plots" had been sown with different cereals during May and June, 1929, and was dressed with 40 lb. superphosphate per acre. Now, as these four areas were at times used for grazing the sheep, it is quite evident that the sheep cannot be regarded as having been carried throughout the year on pastures natural to the district, and if a phosphorus deficiency had existed it must to some extent have been counterbalanced by the feed grown on these areas.

Observations on the fleece were made by the Sheep and Wool Expert, and faecal examinations were carried out at intervals to determine the presence of internal parasites. The sheep were also examined for the presence of external parasites and the ewes were mated in order to determine the effect of the lick supplied, if any, on the progeny. During the mating period of six weeks all the ewes were run together without receiving any lick.

The sheep were drenched prior to being placed in the paddocks with the usual copper sulphate and mustard drench used by the Department in the treatment of the stomach worm, and the drenching repeated in ten days' time. It was decided that if one lot of sheep showed evidence of worm infestation requiring drenching, all should be drenched, and it was found necessary to re-drench the sheep in April, 1930, and this was repeated in May, as some of the sheep were showing unmistakable symptoms of worm infestation.

The sheep were first weighed on 6th June, 1929, and they were in their paddocks on 17th July, 1929.

At the commencement considerable difficulty was experienced in getting the ewes to take the cystine mixture, and a small quantity of molasses was added to it in order that it might be made more palatable.

Towards the end of August mortality occurred amongst the sheep, which was considered to be due to parturient toxaemia. In all nine animals died. Ten of the ewes lambed between 2nd July and 8th August, but lambing proper did not commence until 12th September, an 80 per cent. drop being marked.

The sheep were dipped after shearing (November, 1929), and again six weeks later; no external parasites were found on any examination.

The Body Weights.

The following tables show the alteration in weight both in the ewes and lambs throughout the experiment:—

BODY WEIGHTS AT MONTHLY WEIGHINGS.

Date of Weighing.	A (Proprietary Cystine Mixture).	B (Bone meal).	C (Iodine).	D (No Lick).	Date of Weighing.	A (Proprietary Cystine Mixture).	B (Bone meal)	C (Iodine)	D (No Lick
		Ewes.					*Lambs*		
1929.	lb.	lb.	lb.	lb.	1929.				
6 June ...	94·9	93·1	92·7	93·5	29 Oct. ...	25·15	22·52	23·79	23·98
8 Aug. ...	89·9	86·7	86·6	88·8	4 Nov. ...	28·23	23·84	25·66	23·48
22 Oct. ...	78·0	73·5	79·2	74·8	20 Nov. ...	33·3	31·1	31·6	31·0
20 Nov. ...	76·6	76·7	77·5	74·4	5 Dec. ..	40·0	38·4	35·8	38·9
18 Dec. ...	78·7	76·3	80·3	79·9	18 Dec. ...	39·9	39·6	39·2	41·5
1930.					1930.				
15 Jan. ...	77·3	73·9	79·6	75·5	4 Jan. ...	45·5	41·0	42·5	45·2
12 Feb. ..	77·4	78·4	78·8	78·8	15 Jan. ...	45·0	43·0	44·0	44·0
14 Mar. ...	85·4	81·0	85·0	77·7	29 Jan. ...	49·0	47·0	44·0	47·0
12 April ...	82·7	82·5	94·6	83·0	12 Feb. ...	50·3	49·9	49·4	50·9
25 May ...	90·2	85·6	85·5	85·4	26 Feb. ..	57·0	53·0	53·8	52·7
27 June ...	*104·1	*91·4	*97·05	*91·4	12 April	57·9	57·9	56·6	59·9
1 Aug. ...	78·7	80·5	84·0	82·5	25 May	56·4	55·6	55·7	57·4
					27 June ...	*62·9	*63·6	*67·3	*64·5
					1 Aug. .	51·5	51·3	52·3	53·3

* It was impossible to keep the sheep dry for the June weighing The weights taken during that month are some pounds overweight.

The Lick Consumed and its Cost.

The following tables show the lick consumed by each lot per month, and per sheep per week, and the cost of the licks:—

LICK CONSUMED PER MONTH.

Month.	Lick Consumed.		
	A (Proprietary Cystine Mixture)	B (Bonemeal)	C (Iodine)
1929—	lb.	lb.	lb.
16 July to 30 August	20	50	25
September	38	20	30
October	32	39	32
November	29	51	23½
December . ..	22½	25½	25
1930—			
January	38	37	31½
February	46½	43½	25½
March	52	33	28½
*1–12 April	15½	2	22½
26–31 May	11	10¾	7
June	31	50¼	32½
July	33	16	32
1–13 August	15½	15½	8½
Total	384	393½	323½

* From 12th April to 26th May the lick trial was suspended so that the mating for the breeding trial could be carried out. Also the increase in consumption of lick from January is no doubt due to the lambs commencing to take it, as they would then be four months old.

WEEKLY Consumption of Lick per Sheep.

	Weekly Consumption of Lick per Sheep		
	A (Proprietary Cystine Mixture)	B (Bonemeal)	C (Iodine)
	oz.	oz.	oz.
First six months .	1·184	1·598	1.148
Next three months .	1·45	1·09	·984
Final three months . . .	1·612	1·853	1·579

Cost of the Lick Supplied.

					£	s.	d.
A.—Cystine mixture,	15 lb.	384 lb. consumed.	@ £24 6s. 8d. ton		1	11	3
Salt	25 lb.		@ £6 ton		0	12	10
					£2	4	1
					or £12 17s. 5d. ton		
B.—Bonemeal ...	13⅓ lb.	393½ lb. consumed.	@ £22 5s ton	=	1	6	3.2
Salt	24⅔ lb.		@ £6 ton	=	0	13	11.9
					£2	0	3,
					or £11 9s. 2d. ton,		
C.—Iodine . .	5 oz.	323¼ lb. consumed.	@ £9 4s. 10d. per 10lb.	–	2	6	4
Salt	10 lb		@ £6 ton		0	17	2
					£3	3	6,
					or £21 19s. 11d. ton.		

As regards fertility, it is noted that in the four groups the last lambing percentages were as follows:—

Group A—receiving Cystine Os, 80 per cent.
Group B—receiving bone meal, 90.41 per cent.
Group C—receiving iodine, 85.3 per cent.
Group D—receiving no lick, 80.54 per cent.

It should be noted in connection with this lambing that the ewes concerned had been receiving their respective licks for nine months before they were mated and received the lick again for over two and a half months after mating. Therefore there could be no question that the lick might not have been given for a sufficiently long period to influence fertility or robustness of offspring.

The Effect on the Wool.

Representative samples of the wool from the ewes in the four groups were taken at shearing time, and an examination of these samples was carried out to determine whether any change occurred during the growth, *i.e.*, whether the fibres became finer, and also to see if the growth was sound or otherwise.

It was found that Group A gave the greatest percentage of samples showing change in growth with 88 per cent., Group D being least with 66 per cent. The change in practically every case was a gradual fining of the fibre, in some cases very definite during the last half of the year's growth with, in the majority of samples, a recovery towards the normal growth in the last half inch of fibre, which would represent approximately the last two months of growth.

In each group a percentage of unsound wool was found, but quite a number of the samples which showed a change in growth were still sound. Group A showed the greatest amount of unsoundness. In no case was the wool generally tender, but the weakness when present was at a part of the fibre approximately half an inch from the base, which would represent six weeks to two months before shearing took place, that is when the trial was stopped because of the approach of lambing.

The following table shows the change of growth and soundness:—

Group.	No Change	Gradual Change.	Sound.	Weak.
	Per cent.	Per cent.	Per cent.	Per cent.
A	12	88	41	59
B	32	68	68	32
C	25	75	55	45
D	33	66	66	33

The change in the growth of the fibre would be represented by the gradual strain on the system during pregnancy, though under normal feed conditions a sheep should grow an even type of wool in addition to bearing a lamb.

The average fleece weights were as follows:—

FLEECE Weights.

Group.	Ewes.		Hoggets.	
	lb.	oz.	lb.	oz.
A Group (cystine mixture)	6	0	7	3
B ,, (bonemeal)	6	5	7	2
C ,, (iodine)	6	6	7	4
D ,, (no lick)	6	5	7	4

Comments.

A consideration of these results would indicate that so far as the maintenance of weight of adult sheep is concerned, there is no advantage in providing any of the three licks when sheep are run under the conditions and on the country on which the experiment was conducted. It must be remembered, however, that the sheep had only been brought to New England shortly before the commencement of the trial. The same applies to the growth of the lambs. Judging from previous reports of the effect of providing additional protein, particularly in the form of cystine, one would have anticipated some marked difference both in sheep and lambs in the group receiving the proprietary material declared to contain cystine, but this has not been the case; this group was slightly inferior to any of the others.

As regards fertility, the bonemeal group showed the best results, with the iodine group second, but it would be unsafe to draw definite conclusions from one experiment. In soundness of wool also the bonemeal group showed a slight advantage.

The supply of additional bonemeal has had no effect on growth. Evidently there was no deficiency in the feed the sheep were getting. It is, of course, impossible to say what would have been the effect if the sheep had been fed entirely on unfertilised pastures. The addition of even the large quantities of iodine administered has had no effect in increasing growth or fertility. Evidently there is no iodine deficiency in the area. It might be said that the amount of iodine administered was too large, but the groups on the "cystine" mixture and bonemeal were receiving small quantities of iodine in the salt, but show no marked advantages over the group receiving no lick.

From the point of view of growth and the supply of additional mineral per medium of a lick, the whole experiment is of great interest. Too much reliable work has been done in connection with the supply of mineral and protein over and above that contained in the food to doubt the value of such action where the necessity for it exists. On the other hand, the value of the supply of such material, unless such deficiency exists, is always questionable.

The result of this experiment is again to emphasise the desirability of taking the animal itself as a guide rather than basing one's action on the idea that all stock in all types of country must be provided with certain particular materials.

No ill-effect was noted from the use of any of the licks, except that the manager reported that the lambs in the group receiving iodine appeared to be getting insufficient milk from the ewes, and at the beginning of the fifth month only a small percentage of the ewes were suckling their lambs.

"FRUIT PACKING EQUIPMENT."

ECONOMY in handling fruit depends to a large extent upon the equipment of the packing shed and its arrangement. In this connection the recently issued booklet, "Fruit Packing Equipment," should prove invaluable. It gives plans of and discusses individual and co-operative packing sheds, sizing machines, the packing bench and trolley, a device for holding wrappers, nailing presses, case-making moulds, nail strippers, wiring machines, and contains notes on stacking, gravity conveyors, and case-carrying trucks.

The text and ilustrations fit into twenty-eight pages, and copies of the booklet can be obtained (price 1s. 2d., including postage) from the Department of Agriculture, Box 36A, G.P.O., Sydney.

TUBERCLE-FREE HERDS.

Of the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	202	3 April, 1931
Grafton Experiment Farm (Ayrshires)	180	5 „ 1931
Department of Education, Hurlstone Agricultural High School	45	10 „ 1931
James Wilkins, Jerseyville, Muswellbrook	51	12 „ 1931
Tudor House School, Moss Vale	8	21 „ 1931
Navua Ltd., Grose Wold, via Richmond (Jerseys)	18	29 „ 1931
Australian Missionary College, Cooranbong	45	30 „ 1931
George Rose, Aylmerton	8	28 May, 1931
Department of Education, Gosford Farm Homes	30	3 June, 1931
C. C. Kershaw, Macquarie House, Macquarie Fields	71	5 „ 1931
P. Ubrihien, Corridgeree, Bega	114	6 „ 1931
William Thompson, Masonic School, Baulkham Hills	48	13 „ 1931
Gladesville Mental Hospital	42	25 „ 1931
J. F. Dowe, "Woolomol," Tamworth	48	19 July, 1931
A. L. Logue, Thornbro, Muswellbrook	40	23 „ 1931
A. H. Webb, Quarry-road, Ryde	6	26 „ 1931
A. Shaw, Barrington (Milking Shorthorns)	122	9 Aug., 1931
E. P. Perry, Nundorah, Parkville (Guernseys)	22	13 „ 1931
Wagga Experiment Farm (Jerseys)	55	14 „ 1931
Sacred Heart Convent, Bowral	12	20 „ 1931
St. Patrick's College, Goulburn	8	22 „ 1931
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	46	22 „ 1931
James McCormack, Tumut	111	29 „ 1931
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	81	12 Sept., 1931
S. L. Wills, Greendale Dairy, Cowra	37	19 „ 1931
Wolaroi College, Orange	10	4 Oct., 1931
Riverstone Meat Co., Riverstone Meat Works, Riverstone	104	11 „ 1931
E. S. Cameron, Big Plain, Narrandera	28	14 „ 1931
J. L. W. Barton, Wallerawang	17	17 „ 1931
Newington State Hospital and Home	108	24 „ 1931
J. F. Chaffey, Glen Innes (Ayrshires)	75	4 Nov., 1931
Lunacy Department, Callan Park Mental Hospital	29	13 „ 1931
J. Davies, Puen Buen, Scone (Jerseys)	85	14 „ 1931
Wollongbar Experiment Farm, Lismore (Guernseys)	129	21 „ 1931
Tamworth District Hospital	7	24 „ 1931
Department of Education, Brush Farm, Eastwood	6	9 Dec., 1931
Bathurst Experiment Farm (Jerseys)	21	16 „ 1931
H. A. Corderoy, Wyuna Park, Comboyne (Guernseys)	59	8 Jan., 1932
New England Girls' Grammar School, Armidale	29	9 „ 1932
C. J. Parbery, Allawah, Bega	119	10 „ 1932
New England Experiment Farm, Glen Innes (Ayrshires)	37	12 „ 1932
W. Spindler, Mt. Pleasant, Bega	66	15 „ 1932
D. T. Herbert	68	18 „ 1932
R. C. Dickson, Elwaton, Castle Hill (Jerseys)	17	20 „ 1932
Lunacy Department, Morisset Mental Hospital	22	23 „ 1932
Lidcombe State Hospital and Home	146	11 Feb., 1932
Riverina Welfare Farm, Yanco	77	25 „ 1932
Department of Education, Yanco Agricultural High School	33	26 „ 1932
W. M. McLean, Five Islands Rd., Unanderra	78	27 „ 1932
Mittagong Farm Homes	46	3 Mar., 1932
Kinross Bros., Minnamurra, Inverell (Guernseys)	66	5 „ 1932
Burtenshaw, P. M., Killean, Inverell	50	5 „ 1932
Miss Brennan, Arrankamp, Bowral	10	6 „ 1932
Kyong School, Moss Vale	4	12 „ 1932
G. A. Parish, Jerseyland, Berry	123	13 „ 1932
Lunacy Department, Parramatta Mental Hospital	33	16 „ 1932
Cowra Experiment Farm	32	24 „ 1932
Hawkesbury Agricultural College (Jerseys)	115	5 „ 1932
Russell Lamrock, Orange	4	26 „ 1932
St. Joseph's Convent, Reynold-street, Goulburn	3	26 „ 1932
St. John's Boys Orphanage, Goulburn	9	26 „ 1932
Marion Hill Convent of Mercy, Goulburn	9	26 „ 1932
Lunacy Department, Kenmore Mental Hospital	79	27 „ 1932
St. Joseph's Girls' Orphanage, Kenmore	9	27 „ 1932
J. P. McQuillan, Bethungra Hotel, Bethungra	14	1 April, 1932
St. Michael's Novitiate, Goulburn	5	26 „ 1932

—MAX HENRY, Chief Veterinary Surgeon.

Egg-laying Tests at Hawkesbury Agricultural College.

(Under the Supervision of the Poultry Expert.)

TWENTY-NINTH YEAR'S RESULTS, 1930-31.

F. H. HARVEY, Organising Secretary.

THE twenty-ninth egg laying competition at Hawkesbury Agricultural College commenced on 1st April, 1930, and terminated on 23rd March, 1931, a period of 357 days. The interval between the 23rd and 31st March makes it possible to remove the birds from the pens and provide for the accommodation of entrants for the next test.

The competition was controlled by a committee of management, comprising four officers of the Department of Agriculture and three competitors' representatives, namely, the College Principal (Mr. E. A. Southee), Messrs. E. Hadlington (Poultry Expert, Department of Agriculture), C. Lawrence (Poultry Instructor, Hawkesbury Agricultural College). C. Judson, D. R. Dove, and L. A. Ellis (competitors' representatives), and F. H. Harvey (Department of Agriculture), Organising Secretary. During the absence of Mr. E. Hadlington on a tour abroad Mr. V. H. Brann acted as a member of the committee.

Scope of the Competition.

The competition embraced the usual four sections, was limited to pullets between seven and twelve months old on 1st April, 1930, and pens were allotted as follows:—

	Groups	Birds.		Groups	Birds.
Section A.			*Section C.*		
Open Light Breeds :—			Standard Light Breeds :—		
White Leghorns	55	330	White Leghorns	4	24
			Brown Leghorns	2	12
Section B.			*Section D.*		
Open Heavy Breeds :—			Standard Heavy Breeds :—		
Black Orpingtons	21	126	Black Orpingtons	1	6
Langshans	4	24	Langshans	2	12
			Rhode Island Reds	1	6
			Totals	90	540

Weight of Eggs.

The regulation that hens must lay eggs at least 2 oz. in weight each, and that eggs from groups must average at least 24 oz. per dozen within three months of the commencement of the test to be eligible for prizes, resulted in the disqualification of thirty individual hens and four groups as follows:—

Disqualified from Individual Prizes.

Heavy Breeds.—A. W. Bower (Nos. 7, 11), C. W. Gee (No. 41), H. Martindale (No. 72), A. H. Moxey (No. 76), B. S. Upton (No. 110), A. R. Wheatley (No. 116), B. Becroft (No. 132).

Light Breeds.—W. S. Cartwright (No. 193), R. Newton (Nos. 223, 226), E. F. Goldsmith (No. 273), W. C. Hardy (No. 288), H. Holmes (Nos. 295, 296), Kenrick Bros. (No. 313), T. McDonald (No. 342), J. Rayner (No. 387), J. J. Robinson (No. 400), W. J. Scarboro (No. 418), A. A. Wesley (Nos. 459, 460).

Disqualified from Group Prizes.

Heavy Breeds.—C. Horn and Son, L. Richmond, W. Griffin and Son.
Light Breeds.—Bide-a-wee Poultry Farm.

The Financial Aspect.

The quantities of food consumed by the 540 birds were as follows:—

Wheat	324 bushels	34 lb.	Salt	278 lb.
Maize	173 ,,	10 ,,	Shell grit	23 cwt.
Pollard	778 ,,	0 ,,	Green feed	90 cwt.
Bran	389 ,,	0 ,,	Epsom salts... ...	51 lb.
Meat meal	13 cwt.	79 ,,		

The cost of the foodstuffs (including freight and cartage), on the basis of ruling Sydney market prices, was £190 17s. 3d., equal to 7s. 3d. per head

The value of eggs laid in the competition, calculated at Sydney ruling market prices for new laid eggs, less one penny per dozen pool contribution as from 1st July, 1930, and the usual freight and commission charges, was £570 19s. 10d., equal to an average net price of 1s. 3½d. per dozen.

Averages of Breeds.

No. of Birds	Breed.	Eggs per Hen.	Weight of Eggs per Dozen.	Value per Hen.		
	Open Light Breeds.		oz.	£	s.	d.
330	White Leghorn	202	24½	1	0	5
	Open Heavy Breeds.					
126	Black Orpington	197	25	1	1	8
24	Langshan	191	25	1	1	0
	Standard Light Breeds.					
24	White Leghorn	185	25	0	18	7
12	Brown Leghorn	195	24½	1	1	2
	Standard Heavy Breeds.					
6	Black Orpington	210	24	1	1	7
12	Langshan	186	25	1	0	0
6	Rhode Island Red	210	26	1	1	1

Mortality and Disease.

The casualties due to deaths (thirty-five) and sickness (five) totalled forty, as compared with fifty-five in the previous year.

Particulars of the casualties in the various sections in the two years are as follows:—

	1929-30.		1930-31.	
	Light Breeds	Heavy Breeds.	Light Breeds.	Heavy Breeds
Birds replaced	12	11	13	3
Birds not replaced	15	17	14	10

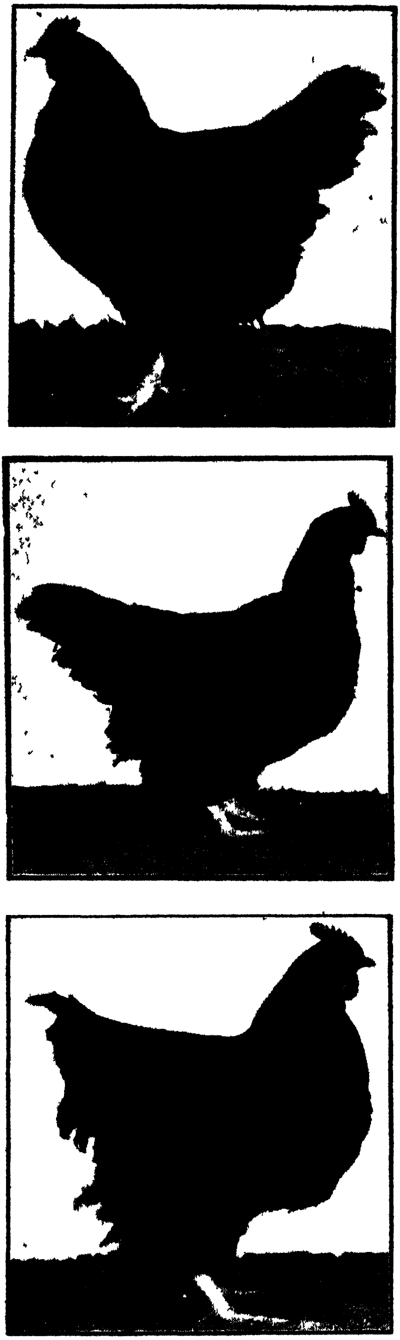
Weights of Winning Birds.

The following are the weights at the beginning and end of the competition of the birds laying the greatest number of eggs:—

		Weight at April, 1930.		Weight at March, 1931	
Groups.		lb.	oz.	lb.	oz
Light Breeds— C. Leach's White Leghorns, Nos.	319	4	2	4	8
	320	4	6	5	0
	321	4	0	4	0
	322	3	12	3	12
	323	3	14	3	14
	324	4	4	4	4
Heavy Breeds— C. Judson and Son's Black Orpingtons, Nos	55	5	0	5	0
	56	5	0	5	8
	57	5	4	5	12
	58	5	4	6	2
	59	5	0	5	8
	60	5	8	5	0
Individual Hens.					
Light Breeds— W. H. Rogers' White Leghorn, No. 408 ...		3	12	4	4
Heavy Breeds— B. Becroft's Langshan, No. 130 .. .		6	6	5	8

The Monthly Laying.

Month.		Section A. Open Light Breeds.		Section B Open Heavy Breeds.		Section C. Standard Light Breeds		Section D. Standard Heavy Breeds.		Total.
		Total for 330 hens.	Average per hen.	Total for 150 hens.	Average per hen	Total for 36 hens.	Average per hen.	Total for 24 hens	Average per hen.	
April,	1930	3,855	11·8	2,580	17·2	426	11·8	256	10·7	7,117
May,	,,	4,871	14·8	2,849	19·0	487	13·5	399	16·6	8,606
June,	,,	4,842	14·7	2,847	19 0	432	12·0	396	16 6	8,517
July,	,,	5,590	16·6	3,109	20 7	525	14·6	494	20 6	9,718
August,	,,	6,768	20·5	3,341	22·3	734	20·4	514	21·4	11,357
September,	,,	6,920	21·0	3,113	20·8	756	21·0	534	22·2	11,325
October,	,,	7,204	21·8	2,775	18·5	759	21·0	478	20·0	11,216
November,	,,	6,433	19·5	2,009	13·4	678	18·8	437	18·2	9,557
December,	,,	6,376	19·3	2,063	13·8	619	17 2	379	15·8	9,437
January,	1931	5,700	17·3	1,882	12·5	648	18·0	360	15·0	8,590
February,	,,	4,960	15·0	1,726	11·5	546	15·1	276	11·5	7,508
March	,,	3,137	9·8	1,364	9·1	293	8·1	224	9·3	5,018
Year 1930-31		66,656	202·0	29,658	197·7	6,903	191·8	4,747	197·8	107,964



Three of C. Judson and Son's Black Orpingtons. Winners of the M.I.B. Consolation Trophy and of the prize for the highest group score in the Open Heavy Breeds Section.

Three of Mr. C. Leach's White Leghorns. Winners of the Golden Egg, 1931, and of the prize for the highest group score in the Open Light Breeds Section.

Annual Competition.

Full details of the financial and other results since the inception of the competition are given in the following comparative table:—

		No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
1st	...	38	1,113	459	137	130	1/1	15/6	6/-	9/6
2nd	...	70	1,308	666	160	163	1/3¾	17/9	5 9¾	12/-
3rd	...	100	1,224	532	154	152	1/-	12/9	4/5½	8/3
4th	...	100	1,411	635	168	166	-/11½	13/3	5/3½	8/-
5th	...	100	1,481	721	162	171	1/0½	14/10	5/10	9/-
6th	...	60	1,474	665	161	173	1/2¼	17/2	7/-	10/2
7th	...	50	1,379	656	159	180	1/3¼	19/2	7/9½	11/4
8th	...	60	1,394	739	158	181	1/5¼	21/9	6/9	15/-
9th	...	40	1,321	658	151	168	1/2	16/3½	6/5½	10/2
10th	...	50	1,389	687	146	184	1/2½	18/5½	6/1½	12/4
11th	...	50	1,461	603	156	178	1/3½	19/4¼	7/3½	12/0¾
12th	...	50	1,360	724	152	177	1/2½	17/7	5/9	11/10
13th	...	63	1,541	705	162	181	1/2	17/8½	6/9½	10/11
14th	...	70	1,449	506	165	192	1/4½	22/2	7/7	14/7
15th	A	40	1,526	924	162	216	1/3¾	28/8¾	6/10	16/10¾
	B	30	1,479	749	165	192	1/3¾	21/7½	6/10	14/9½
	Total	70	...	..	..	206	1/3¼	25/8	6/10	18/10
16th	A	40	1,525	923	157	209	1/4	21/9¾	7/8	14/1¾
	B	30	1,613	931	170	202	1/4	21/2	7/8	13/6
	Total	70	......	..	...	206	1/4	21/6	7/8	13/10
17th	A	40	1,448	860	153	199	1/5½	22/0½	7/10	14/2½
	B	30	1,517	815	151	189	1/5½	21/11¼	7/10	14/1¼
	Total	70	......	...	.	195	1/5½	22/-	7/10	14/2
18th	A	30	1,438	988	148	203	1/10	28/10	9/3	19/7
	B	50	1,428	745	151	190	1/10	28/1	9/3	18/10
	C	3	1,304	977	138	195	1/10	27/8	9/3	18/5
	D	7	1,336	955	150	191	1/10	28/5	9/3	19/2
	Total	90	......		.	195	1/10	28/4	9/3	19/1
19th	A	33	1,516	996	167	206	2/2	37/11	12/8	25/3
	B	47	1,488	955	168	204	2/2	37/11	12/8	25/3
	C	5	1,425	944	148	195	2/2	36/-	12/8	23/4
	D	5	1,298	1,020	150	193	2/2	35/9	12/8	23/1
	Total	90	......	...	...	204	2/2	37/8	12/8	25/-
20th	A	45	1,480	881	157	196	1/11	30/10	11/9	19/1
	B	35	1,457	696	160	192	1/11	31/2	11/9	19/5
	C	5	1,092	885	144	168	1/11	24/7	11/9	12/10
	D	5	1,370	1,092	147	197	1/11	33/5	11/9	21/8
	Total	90	......	...	...	193	1/11	30/8	11/9	18/11
21st	A	50	1,425	646	164	195	1/9	28/5	10/10	17/7
	B	30	1,417	720	164	188	1/9	27/5	10/10	16/7
	C	5	1,220	864	149	176	1/9	25/8	10/10	14/10
	D	5	1,212	931	144	187	1/9	27/3	10/10	16/5
	Total	90	......	...	...	191	1/9	27/10	10/10	17/-

Explanatory Note.—A, Open Light Breeds; B, Open Heavy Breeds; C, Standard Light Breeds; D, Standard Heavy Breeds.

Annual Competition—*continued.*

		No. of Groups.	Winning Total.	Lowest Total	Highest Monthly Total.	Average per Hen.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
22nd	A	50	1,508	942	161	210	1/6	26/3	9/9	16/6
	B	30	1,600	871	164	203	1/6	26/3	9/9	16/6
	C	5	1,307	692	142	170	1/6	21/1	9/9	11/4
	D	5	1,430	1,052	152	205	1/6	26/9	9/9	17/-
	Total	90	...	...	...	205	1/6	25/11	9/9	16/2
23rd	A	57	1,470	961	160	212	1/8	28/7	9/11	18/8
	B	23	1,558	1,006	164	211	1/8	29/2	9/11	19/3
	C	5	1,291	950	146	180	1/8	23/5	9/11	13/6
	D	5	1,308	1,049	159	192	1/8	27/5	9/11	17/6
	Total	90	...	...	...	209	1/8	28/3	9/11	18/4
24th	A	50	1,444	803	158	206	1/6	26/5	10/-	16/5
	B	30	1,466	916	171	199	1/6	26/4	10/-	16/4
	C	5	1,248	881	136	187	1/6	25/-	10/-	15/-
	D	5	1,331	777	151	186	1/6	24/7	10/-	14/7
	Total	90	....	...	...	201	1/6	26/2	10/–	16/2
25th	A	51	1,531	797	162	209	1/8½	29/4	11/-	18/4
	B	29	1,519	753	161	204	1/8½	29/2	11/-	18/2
	C	5	1,319	1,092	147	173	1/8½	23/8	11/-	12/8
	D	5	1,326	842	155	203	1/8½	28/9	11/-	17/9
	Total	90	...	...	...	205	1/8½	28/11	11/–	17/4
26th	A	50	1,505	885	162	205	1/10	30/9	9/7	21/2
	B	30	1,487	1,005	165	207	1/10	31/11	9/7	22/4
	C	5	1,234	790	138	168	1/10	24/1	9/7	14/6
	D	5	1,339	1,029	149	192	1/10	30/-	9/7	20/5
	Total	90	..		.	203	1/10	30/9	9/7	21/2
27th	A	55	1,531	868	173	201	1/9½	30/2	8/7	21/7
	B	25	1,386	954	163	201	1/9½	30/11	8/7	22/4
	C	5	1,302	914	147	177	1/9½	26/6	8/7	17/11
	D	5	1,259	883	155	176	1/9½	26/1	8/7	17/6
	Total	90	... ..	. .	...	198	1/9½	29/11	8/7	21/4
28th	A	55	1,496	891	161	206	1/6	25/1	9/10	15/3
	B	25	1,544	931	165	212	1/6	26/11	9/10	17/1
	C	5	1,319	1,190	151	211	1/6	25/11	9/10	16/1
	D	5	1,239	968	160	196	1/6	23/10	9/10	14/0
	Total	90	... .		...	207	1/6	25/7	9/10	15/9
29th	A	55	1,520	790	158	202	1/3½	20/5	7/3	13/2
	B	25	1,443	925	167	198	1/3½	21/6	7/3	14/3
	C	6	1,280	1,001	146	192	1/3½	19/5	7/3	12/2
	D	4	1,260	1,099	147	198	1/3½	20/8	7/3	13/5
	Total	90	....	.	...	200	1/3½	21/2	7/3	13/11

EXPLANATORY NOTE.—A, Open Light Breeds; B, Open Heavy Breeds; C, Standard Light Breeds; D, Standard Heavy Breeds.

PRIZE LIST.

GRAND CHAMPION (VALUE, £10 10s.).

For the group of six birds laying eggs of the greatest market value during the competition without replacement of a bird.—C. Leach (White Leghorns), market value £7 19s. 1d.

GOLDEN EGG OF 1931 (VALUE, £25).

Donated by the Metropolitan Meat Industry Board for groups of six birds completing the competition; points to be awarded for number, quality, and market value of eggs, and standard quality of the birds.—C. Leach (White Leghorns), 68 points.

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SPECIAL PRIZES.

CONSOLATION PRIZE (Value £10 10s.).

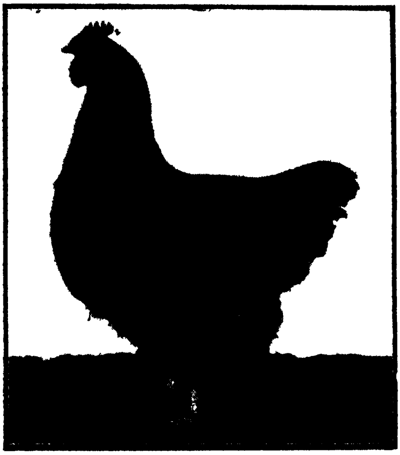
Donated by the Metropolitan Meat Industry Board, to be awarded to the leading group in the division opposite to that gaining the "Golden Egg," judged on the same scale of points.—C. Judson and Son (Black Orpingtons), 63 points.

HADLINGTON COMMEMORATION MEDAL.

Donated by Mr. W. H. Paine, Superintendent, Animal Foods Department, Metropolitan Meat Industry Board, for groups selected to compete for quality prizes, and those in the Standard sections which complete the competition without replacement of a bird and lay at least 1,100 eggs; points awarded for type and breed characteristics, weight of birds and weight of eggs. (In the event of a tie, the medal is awarded on number of eggs laid).—C. E. Messervy, 67½ points (1,259 eggs). Mrs. M. Attuell's birds (1,121 eggs) also scored 67½ points, but the prize was awarded to Mr. Messervey on number of eggs laid, as provided in the regulation.

Mr. E. Watts' White Leghorn.

One of the group that won the prize for highest score in the Standard Light Breeds Section.



Mr. C. B. Knight's Black Orpington.

One of the birds of the group that won the prize for the highest score in the Standard Heavy Breeds Section.

JUDSON AND WIMBLEFORD.—Special Prizes of £3 3s. each (donated by Messrs. C. Judson and Son and F. T. Wimble) for heavy and light breeds respectively, for groups scoring most points on the following scale:—Each bird laying 250 eggs or over, 3 points; each bird laying 240-249 eggs, 2 points; each bird laying 225-239 eggs, 1 point. Provided that the number of eggs laid by the group shall be not less than 1,350; no group belonging to the donors to compete for the prize; in the event of a tie, the award to be made to the group with the highest aggregate.

Heavy Breeds.—No award.

Light Breeds.—R. A. Jacobs, White Leghorns (1,465 eggs), 12 points. Mr. J. Richings, White Leghorns, also scored 12 points, but laid 1,455 eggs, and the prize was awarded on highest aggregate score.

THE WIMBLEFORD THOUSAND, value £2 2s. first and £1 1s. second (donated by Mr. F. T. Wimble), for the first and second groups of White Leghorns to lay 1,000 eggs; no entry by the donor to compete.—S. E. Daley, 19th November, 1930, 1st, £2 2s.; H. W. T. Hambly, 22nd November, 1930, 2nd, £1 1s.

THE "POULTRY" NEWSPAPER, value £3 3s. (donated by *Poultry* newspaper), for the individual hen which first lays 200 eggs during the competition.—G. Bennett (Black Orpington), 200th egg on 4th November, 1930.

THE PRODUCERS' CO-OPERATIVE DISTRIBUTING SOCIETY, value £2 2s. (donated by the Producers' Co-operative Distributing Society), for the individual hen which lays the greatest score without break of a day.—G. Bennett (Black Orpington), laid 56 eggs from 6th July to 30th August, 1930.

QUALITY PRIZES (OPEN SECTIONS).

For highest scores from groups selected for standard points and laying at least 1,200 eggs of prescribed weight.

Heavy Breeds.—C. Judson and Son (Black Orpingtons), 1,443 eggs, £5; R. Bray (Black Orpingtons), 1,307 eggs, £2 10s

Light Breeds.—C. Leach (White Leghorns), 1,520 eggs, £5; D R. Dove (White Leghorns, 1,376 eggs, £2 10s.

QUALITY PRIZES (STANDARD SECTIONS).

For groups laying the greatest number of eggs; no prize to be awarded to any group laying less than 1,100 eggs.

Heavy Breeds.—C. B. Knight (Black Orpingtons), 1,260 eggs, £2; C. E. Messervy (Rhode Island Reds), 1,259 eggs, £1

Light Breeds.—E. Watts (White Leghorns), 1,280 eggs, £2; C. R. Brown (White Leghorns), 1,174 eggs, £1.

HIGHEST GROUP SCORES

Heavy Breeds.—C. Judson and Son (Black Orpingtons), 1,443 eggs, £3; R Bray (Black Orpingtons), 1,307 eggs, £2 10s.; J. W. Smiles (Black Orpingtons), 1,293 eggs, £2; A. Thompson (Black Orpingtons), 1,271 eggs, £1 10s.; C. B. Knight(Black Orpingtons), 1,260 eggs, £1.

Light Breeds.—C. Leach (White Leghorns), 1,520 eggs, £3; R. A Jacobs (White Leghorns), 1,465 eggs, £2 10s; H. W. T. Hambly (White Leghorns), 1,458 eggs, £2; J. Richings (White Leghorns), 1,455 eggs, £1 10s.; S. E. Daley (White Leghorns), 1,426 eggs, £1.

HIGHEST INDIVIDUAL SCORES.

Heavy Breeds—G. Bennett (Black Orpington), 293 eggs, £2 10s.; B. Becroft (Langshan No. 128), 290 eggs, and B. Becroft (Langshan No. 130), 290 eggs, divided 2nd and 3rd prizes (£2 and £1 10s.); B. Becroft (Langshan No. 129), 289 eggs, £1.

Light Breeds.—W. H. Rogers (White Leghorn), 301 eggs, £2 10s.; C. Leach (White Leghorn), 292 eggs, £2; W. S. Cartwright (White Leghorn), 288 eggs, £1 10s.; W. C. Hardy (White Leghorn), 284 eggs, £1

QUARTERLY (GROUP) PRIZES.

Winter Test (1st April to 30th June, 1930).

Heavy Breeds.—G. Bennett, 423 eggs, £2; C. Judson and Son, 391 eggs, £1 10s

Light Breeds.—S. E. Daley, 353 eggs, £2; Mrs. M. G. Cummings, 346 eggs, £1 10s.

Spring Test (1st July to 30th September, 1930).

Heavy Breeds.—C. E. Messervy, 435 eggs, £1 10s ; C. Judson and Son, 421 eggs, £1.

Light Breeds.—J. Richings, 420 eggs, £1 10s.; S E. Daley, 411 eggs, £1.

Summer Test (1st October to 31st December, 1930).

Heavy Breeds.—R. Bray, 371 eggs, £1 10s.; C. E. Messervy, 361 eggs, £1.

Light Breeds.—R. A. Jacobs, 446 eggs, £1 10s.; W. H. Rogers, 444 eggs, £1.

Autumn Test (1st January to 23rd March, 1931).

Heavy Breeds.—C. Judson and Son, 277 eggs, £2; J. W. Smiles, 255 eggs, £1 10s.

Light Breeds.—C. Leach, 366 eggs, £2; R. A. Jacobs, 357 eggs, £1 10s.

Monthly Laying of Individual Prize Winners.

The following table shows the monthly laying of winners of the individual prizes for highest scores:—

Owner.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Total
						Heavy Breeds.							
G. Bennett	22	30	20	29	30	26	30	24	25	19	21	8	293
B. Becroft	23	27	26	24	27	25	27	23	27	25	18	18	290
B. Becroft	16	27	24	27	26	29	26	26	24	24	23	18	290
B. Becroft..	25	29	25	28	28	28	28	24	6	25	26	17	289
						Light Breeds.							
W. H. Rogers	18	24	22	23	26	25	30	29	28	29	27	20	301
C. Leach .	24	24	21	21	24	25	27	25	28	27	26	20	292
W. S. Cartwright	8	24	23	22	27	28	31	27	28	26	25	19	288
W. C. Hardy	20	25	25	26	25	27	26	24	19	27	22	18	284

EGG-YIELD OF EACH BIRD AND GROUP IN THE TWENTY-NINTH ANNUAL COMPETITION.

Owner and Breed.	Individual Scores.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.		
				Open Section: Heavy Breeds.							
								oz	£	s.	d
C. Judson and Son: Black Orpingtons.	270	206	242	264	254	207	1,443	25	7	16	9
L. Richmond: Black Orpingtons...	217	280	*193	274	261	*254	*1,429	*23½	7	8	10
C. Horn and Son: Black Orpingtons	260	226	*132	235	222	*254	*1,320	*23½	7	3	11
B. Becroft: Langshans	151	290	289	290	188	*166	1,324	24½	7	11	11
R. Bray: Black Orpingtons ..	‡145	215	222	230	266	229	1,307	25	6	17	1
J. W. Smiles: Black Orpingtons	102	262	208	230	264	227	1,293	24	7	1	6
A. Thompson: Black Orpingtons...	232	255	224	204	155	201	1,271	24½	6	18	1
H. Martindale: Black Orpingtons	255	258	176	155	§131	*277	1,252	25	6	19	5
W. Griffin and Son: Langshans ...	199	167	195	*208	*206	*238	*1,213	24	6	4	11
J. Carr: Black Orpingtons .	169	233	153	209	224	200	1,188	25	6	8	9
W. W. Tennent: Black Orpingtons	198	98	240	253	§165	229	1,183	25½	6	11	0
Mrs. V. E. Cox: Black Orpingtons	190	209	175	247	161	200	1,182	25½	6	5	3
A. H. Moxey: Black Orpingtons...	238	149	210	*126	270	§181	1,174	25	6	1	7
G. E. Holmes: Black Orpingtons	216	205	272	173	210	97	1,173	25	6	0	8
W. Clayton: Black Orpingtons ...	154	274	210	103	158	270	1,169	25	6	14	4
C. W. Gee: Black Orpingtons ...	192	222	265	178	*169	114	1,140	24	6	7	2
B. S. Upton: Black Orpingtons ...	129	*§172	261	140	254	178	1,134	24½	6	4	1
F. C. Nicholls: Langshans ...	248	141	180	196	236	130	1,131	25	6	4	0
G. Bennett: Black Orpingtons ...	134	208	127	293	164	193	1,119	25	6	13	7
A. R. Sinclair: Black Orpingtons...	227	172	138	§135	203	238	1,113	25	6	4	9
A. R. Wheatley: Black Orpingtons	208	*253	244	272	§76	18	1,071	24½	5	19	8
Woodlands Poultry Farm: Black Orpingtons.	238	227	93	191	148	132	1,029	24½	5	15	10
Mrs. C. E. Madrers: Black Orpingtons.	154	213	165	§123	204	147	1,006	25½	5	12	6
A. W. Bower: Black Orpingtons...	*§166	§60	253	280	*187	68	959	25	5	1	10
E. J. Whalan: Langshans ...	93	168	145	‡188	96	235	925	25	5	3	6
				Open Section: Light Breeds.							
C. Leach: White Leghorns ...	292	238	274	267	238	211	1,520	25	7	19	1
Bide-a-Wee Poultry Farm: White Leghorns.	257	267	231	259	235	*241	*1,490	23¾	7	18	11
R. A. Jacobs: White Leghorns ...	251	225	264	251	237	237	1,465	24	7	8	5
H. W. T. Hambly: White Leghorns	242	247	278	211	263	217	1,458	25½	7	13	11
J. Richings: White Leghorns ...	252	225	250	†225	265	238	1,455	25	7	11	7
T. McDonald: White Leghorns ...	268	248	261	264	158	*236	1,435	24½	7	12	7
S. E. Daley: White Leghorns ...	273	216	228	‡200	241	268	1,426	25	7	12	2
W. H. Rogers: White Leghorns ...	205	258	190	197	238	301	1,384	24½	7	0	6
C. S. Brown: White Leghorns ...	230	203	176	282	235	255	1,381	26	7	1	2
D. R. Dove: White Leghorns ...	238	212	205	219	234	278	1,376	24½	6	15	6

EGG-YIELD OF EACH BIRD AND GROUP IN THE TWENTY-NINTH ANNUAL COMPETITION—*continued.*

Open Section: Light Breeds—continued.

Owner and Breed.	Totals of Individual Hens.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.		
									£	s.	d.
F. A. Bailey: White Leghorns ...	225	210	230	205	232	229	1,331	25	6	12	4
R. B. Dent: White Leghorns ...	248	211	252	217	155	241	1,324	25	6	19	3
H. Holmes: White Leghorns ...	*259	*265	246	§150	171	230	1,321	24½	6	14	11
Maadi Poultry Farm: White Leghorns.	271	‡194	192	185	242	237	1,321	25	6	17	7
Mrs. M. G. Cummings: White Leghorns.	188	252	228	142	237	265	1,312	26	7	2	3
W. R. Oliver. White Leghorns ...	192	247	226	241	173	232	1,311	25	6	18	1
H. P. Christie: White Leghorns ...	219	234	196	280	‡142	242	1,263	25	6	6	2
R. G. Christie and Son: White Leghorns.	209	236	219	195	167	236	1,262	25	6	6	9
A. E. Passlow: White Leghorns ...	232	181	233	206	191	217	1,260	26	6	7	4
J. Oates: White Leghorns ...	187	249	227	78	248	268	1,257	25	6	10	2
F. T. Turner: White Leghorns ...	252	§180	180	126	256	253	1,247	25½	6	7	6
H. L. Abrook: White Leghorns ...	225	189	205	198	175	244	1,236	25	5	17	2
H. W. Jones: White Leghorns ...	227	183	217	234	233	141	1,235	24	6	7	6
F. T. Wimble: White Leghorns ...	223	237	241	§144	175	213	1,233	25½	6	7	4
Kenrick Bros.: White Leghorns ..	*278	240	210	224	71	188	1,211	25	6	5	11
W. J. Scarboro: White Leghorns	198	234	211	*138	192	244	1,217	24½	6	6	3
B. L. Blake: White Leghorns ..	242	191	212	260	101	‡202	1 208	25	6	3	0
H. S. Thompson: White Leghorns	238	216	§182	‡127	212	230	1,205	25½	6	0	2
I. Lowery: White Leghorns .	236	228	57	200	272	‡208	1,201	25	6	4	5
L. A. Ellis: White Leghorns ...	184	189	177	191	247	211	1,199	25	5	18	2
Hilder Bros.: White Leghorns ...	175	256	217	216	175	152	1,191	25	6	1	10
N. Rosso: White Leghorns ...	132	§144	269	197	218	227	1,187	25½	6	0	7
W. C. Hardy: White Leghorns ...	193	284	§228	232	217	*22	1.176	24½	6	0	8
B. Clarke: White Leghorns ..	163	124	226	218	‡209	244	1,175	25	6	0	11
R. Whitelaw, jnr.: White Leghorns	214	220	136	225	209	169	1,173	25	5	18	10
J. J. Robinson: White Leghorns	219	§68	188	*260	239	200	1,174	24	6	8	3
H. R. Nelson: White Leghorns ...	199	225	§175	186	167	219	1,171	25	5	17	11
H. P. Toop: White Leghorns ...	214	214	178	113	224	220	1,163	25	5	17	11
P. O. Ranch: White Leghorns ...	229	§84	186	265	186	195	1,145	25	5	16	4
Watson & Stepney: White Leghorns.	230	222	199	108	200	184	1,143	25	5	14	1
K. R. Slade: White Leghorns ..	‡105	215	157	223	219	221	1,140	24	6	3	6
G. N. Mann: White Leghorns ...	229	202	185	164	187	168	1,135	25	5	19	6
H. & W. Bailey: White Leghorns	188	§133	238	237	137	188	1,121	25	6	3	7
K. G. Cobcroft: White Leghorns...	‡80	240	215	186	193	200	1,114	25	5	4	11
W. S. Cartwright: White Leghorns	*1	162	288	255	158	248	1,112	25½	5	19	9
H. A. Duncan: White Leghorns ...	234	200	204	83	149	220	1,090	25	5	14	11
D. Asher: White Leghorns ...	227	80	203	§70	246	241	1,067	24½	5	11	2
F. Crisp: White Leghorns... ...	155	232	§185	154	§104	224	1,054	25½	5	11	9
E. F. Goldsmith: White Leghorns	172	188	*119	254	189	‡121	1,043	25½	5	0	0
W. I. Williams: White Leghorns...	108	156	145	170	243	205	1,027	25½	5	5	1
Neal Bros.: White Leghorns ...	168	155	283	141	128	186	1,011	25	4	16	7
J. Rayner: White Leghorns ...	171	215	*116	217	178	107	1,004	25	5	10	0
J. L. Flew: White Leghorns ...	188	220	13	16	145	255	837	25	4	5	8
A. A. Wesley: White Leghorns ...	177	237	*1	*§23	110	263	811	24½	4	3	10
R. Newton: White Leghorns ...	*‡111	37	199	*207	48	188	790	24	3	17	7

Standard Section: Light Breeds.

Owner and Breed.	Totals of Individual Hens.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.		
									£	s.	d.
E Watts: White Leghorns ...	230	208	244	165	180	253	1,280	25	6	14	10
C. R. Brown: Brown Leghorns ...	218	137	209	205	204	201	1,174	24½	6	2	6
Davies & Webb: Brown Leghorns	206	163	198	195	208	198	1,168	24½	5	11	9
J. Cornwell: White Leghorns ...	247	212	‡187	117	206	172	1,141	25	5	12	3
Mrs. M. Attuell: White Leghorns	212	182	227	149	116	235	1,121	26	5	19	8
C. Carpenter: White Leghorns ...	166	‡143	179	106	194	213	1,001	25	4	18	3

Standard Section: Heavy Breeds.

Owner and Breed.	Totals of Individual Hens.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.		
									£	s.	d.
O. B. Knight: Black Orpingtons...	208	‡222	202	218	207	203	1,260	24½	6	9	8
C. E. Messervy: Rhode Island Reds.	185	169	255	205	234	211	1,259	26	6	6	4
P. A. Barrett: Langshans ...	210	‡157	210	166	202	183	1,129	25	5	18	7
Boyle S. T. P. Farm: Langshans...	180	207	177	201	168	166	1,099	25	6	1	1

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* Signifies bird did not lay eggs of standard of 24 oz. per dozen within the prescribed period.

† Received an allowance of 155 eggs in terms of Rule 17.

‡ Signifies bird replaced and previous score struck out.

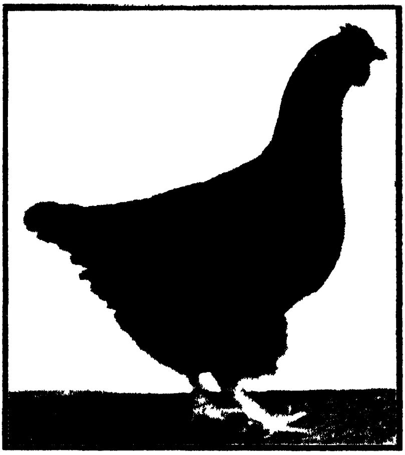
§ Signifies bird dead, not replaced, score retained.

COMMENTS BY THE POULTRY EXPERT.

The main feature of interest in the test just concluded is that White Leghorns have again put up the highest group score, with a total of 1,520 eggs, which number has only been exceeded in these tests by this breed on three previous occasions. To a White Leghorn hen, the property of Mr. W. H. Rogers, also lies the credit of the highest individual score, the bird having laid 301 eggs in 357 days.

The General Average Production.

The general average production has again receded to the 200 egg mark after a rise last year to 206.9. This is an important aspect of these tests, because the general average production is a reflection of the commercial poultry farmers' skill in breeding for high fecundity, and one would expect, after all the years of testing work and striving for improvement in egg production, that the average for the whole competition would be increased. However, in this connection it is interesting to compare the results of the leading egg-laying tests in England and America, which show that we can still hold our own.



Mr. C. E. Messervy's Rhode Island Red.
One of the group that won the Hadlington Commemoration Medal.

Mr. W. H. Rogers' White Leghorn.
Winner of the prize for highest individual score.

In the National Egg-laying Competition, at Milford, England, during 1929-30, and covering a period of forty-eight weeks, the average for the main breeds were as follows:—

White Leghorn (832 birds)	Average	188·03 eggs.
White Wyandotte (760 birds)	,,	190·95 ,,
Rhode Island Red (620 birds)	,,	190·31 ,,
Australorp (36 birds)	,,	183·67 ,,
General average for the whole competition ...		185·10 ,,

In the Lancashire Egg-laying Contest, 1929-30, covering a period of forty-eight weeks, the averages were:—

White Leghorn (408 birds)	Average	177·97	eggs.
White Wyandotte (355 birds)	,,	185·31	,,
Rhode Island Red (291 birds)	,,	182·20	,,
Australorp (7 birds)	,,	153·58	,,
Average for the whole competition		180·23	,,

In the United States of America the averages of the main breeds in twelve of the leading laying contests covering a period of forty-eight weeks are as under:—

White Leghorn (5,780 birds)	Average	194	eggs.
Rhode Island Red (760 birds)	,,	161·4	,,
Bardrock (630 birds)	,,	166·5	,,
Australorp (100 birds)	,,	188·4	,,
General average for the whole of the breeds in these tests		185·4	,,

The rate of mortality in three of the leading contests in England (National, Harper Adams, and Northern V.P.S.) is a good deal higher than the Hawkesbury College contest, the figures being:—White Leghorn, 14.1 per cent.; White Wyandottes, 10.3 per cent.; and Rhode Island Reds, 6.2 per cent. The mortality in the American contests mentioned above is not available, but in another laying contest in New Brunswick, U.S.A., where 927 birds were competing, laying an average of 209 eggs in fifty-one weeks, the deaths amounted to 26.53 per cent. In the contest at Hawkesbury College which has just concluded the deaths amounted to 6½ per cent.

Weight of Eggs.

The number of birds laying underweight eggs in this contest was somewhat lower than in the previous one, the figures being thirty individual hens and four groups compared with thirty-six hens and three groups last year. The average weight of eggs, however, in the Open Light Section is slightly below that of last year, being 24½ oz. as against 25 oz. last year. In the Open Heavy Breeds Section the average was the same as last year, viz., 25 oz. The size of eggs should be carefully watched by all breeders with a view to improvement. It is of paramount importance, as its effect will be felt in the returns from the flocks, because the greater the number of under-sized eggs the lower will be the average price to the producer.

The Financial Aspect.

The cost of feeding, due to the low rates ruling during the latter half of the year, works out at 7s. 3d. per hen, compared with 9s. 10d. last year, and the average price of eggs is also lower by 2¼d. per dozen, the figures being 1s. 3¾d. per dozen this year against 1s. 6d. last year. These figures are based upon the wholesale price of eggs less market charges and contribution to pool, and the feed costs are worked out on the ruling Sydney prices plus handling charges.

Prevention of Decay in Oranges.

R. J. BENTON, Special Fruit Instructor.

THE conclusive results obtained during five years' experiments with borax and other agents as preventives of decay (principally penicillium rots) in oranges suggested the trial of such agents on as large a scale as possible. The main object was to demonstrate the financial advantage of such treatment, the plan being to obtain fruit from growers (on Mangrove Mountain and Gosford lowlands) in November, and after treatment to store for about three months, and return it to the growers' agents for sale. In February as a rule oranges realise very high prices. It is unfortunate that this season the market should have been very depressed.

The labour required was supplied by the Gosford Boys' Home, the officials of which co-operated splendidly in the assistance of Messrs. W. B. Stokes, A. T. Hunter, F. T. Bowman, and myself.

Approximately half the fruit was mountain-grown. About 45 per cent. of the oranges from each grower were dipped in borax solution and then paraffined, and 45 per cent. were similarly treated except that bicarbonate of soda was used in place of borax, 10 per cent. of each lot being left untreated. An 8 per cent. borax solution and a 3 per cent. bicarbonate of soda solution were employed. In each case the solution was heated to 110 deg. Fahr. and the fruit immersed for four minutes. Liquid paraffin was then applied by hand, and the fruit packed and cold stored.

The quality of the fruit received was mainly very good, but several lots were affected, one lot (Grower No. 6) very badly, with black spot. There were no indications during storage of increased black spot infection, but the existing infection was emphasised as the colours of the infected and clean areas deepened and gained in contrast. A proportion of the fruit (greater in the lowland-grown than in the mountain-grown) developed a brown scalded appearance typical of storage damage in low temperatures. An increasing tendency to decay from stem-end rots in most of the fruit after storage for twelve weeks suggested reduced vitality and the necessity for disposal. Only two growers (Nos. 1 and 5) clipped the fruit, the other six supplying fruit pulled from the trees. This appeared to make little if any difference in keeping quality.

Over 27,000 oranges were handled in the 185 bushels of fruit received. The results detailed hereunder demonstrate that borax was the more efficient agent in preventing decay. The decays in untreated fruit were 3.35 and 2.06 times greater than in fruit treated with borax and bicarbonate of soda respectively. The appearance of the treated fruit was also better than that of the untreated. The mountain-grown oranges had little more than half the amount of decay found in the lowland-grown fruit, the losses being 7.17 per cent. and 11.82 per cent. respectively.

With the exception of that of Grower No. 6, which was repacked and sold on 28th January, the fruit was stored from 25th November to 18th February. In storage over such a period a shrinkage of at least 5 per cent. is ordinarily to be expected. In a few cases some shrinkage was apparent, but in most instances, owing to the effect of the paraffin treatment, no shrinkage had occurred. Where it had occurred the application of paraffin had no doubt been faulty. This was to be expected in the absence of mechanical methods of application.

Whereas an inspection of part of the fruit a fortnight before the end of the period of storage did not reveal much decay, it was apparent that decay was definitely increasing, and, there being no prospect of the market rate improving, it was decided to dispose of the fruit.

DETAILS of Results of Different Treatments.

Grower's No. ..	1	2	3	4	5	6*	7	8
Cases supplied ..	50	20	20	10	23	25	17	20
Cases repacked ...	47	18	18	8	21	21	14	16
				Borax-Paraffin Treatment.				
Number of oranges ..	3,017	1,248	1,442	714	1,146	2,866	1,390	1,503
Number infected with Blue Mould.	18	22	11	5	13	11	12	14
Other decay	29	27	47	12	9	84	33	32
Percentage infected with Blue Mould.	·59	1·76	1·76	·7	1·13	·38	·86	·93
Percentage all decays	1·55	3·9	4·02	2·38	1·92	3·31	3·23	3·06
				Sodium Bicarbonate-Paraffin Treatment.				
Number of oranges ...	2,747	1,356	748	538	1,463	1,931	755	1,509
Number infected with Blue Mould.	36	50	9	21	35	19	21	17
Other decay	14	35	74	15	14	84	12	54
Percentage infected with Blue Mould.	1·31	3·68	1·2	3·9	2·39	·98	2·78	1·12
Percentage all decays	1·82	6·26	11·09	6·69	3·34	5·33	4·37	4·7
				Untreated.				
Number of oranges ...	706	313	226	104	226	409	276	379
Number infected with Blue Mould.	19	15	13	29	26	6	46	31
Other decay	3	8	6	8	2	16	10	13
Percentage infected with Blue Mould.	2·69	4·79	5·75	27·9	11·5	1·46	16·6	8·18
Percentage all decays	3·1	7·34	8·4	35·57	12·39	5·38	20·29	11·6

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* Repacked and sold 28th January.

COMPARATIVE Infection in Mountain-grown and Lowland-grown Fruit.

	Mountain-grown Fruit.			Lowland-grown Fruit.		
	Number of oranges	Number decayed.	Percentage decayed.	Number of oranges	Number decayed.	Percentage decayed.
Borax-paraffin treatment ...	5,666	115	2·03	7,660	264	3·44
Sodium bicarbonate-paraffin treatment	5,719	170	2 97	5,328	340	6·38
Total oranges treated ...	11,385	285	2·5	12,988	604	4·6
Not treated	1,311	94	7·17	1,328	157	11·82

		Number Decayed.	Percentage Decayed.
Total oranges treated by Borax-paraffin method . .	13,326	379	2·84
,, ,, Sodium bicarbonate-paraffin method . . .	11,047	510	4·61
,, untreated	2,639	251	9·51

Of the 185 bushels of oranges received, 22 bushels were lost in repacking due to the decays shown, black spot, storage scald, and shrinkage. Loss was also occasioned by reason of odd lots of variously-sized fruit being left over when repacking.

It is desired to thank the growers who so willingly supplied fruit for the purpose of the experiments; also the Superintendent of the Boys' Home, Gosford, for loaning the necessary labour, and the Gosford Packing House in providing space for conducting the work.

OAT GRAIN VARIETY TRIALS AT TRANGIE, 1930.

TRIALS to determine the most suitable varieties of grain oats for the Trangie district were continued last year at Trangie Experiment Farm.

The plots were sown in triplicate on 10th April, using 49 lb. seed and 50 lb. superphosphate per acre. Windstorms prior to harvesting on 1st November caused all varieties to lodge. The yields were as follows, the figures in parentheses being the percentage average yields based on the yield of the standard variety for whatever number of years the variety has been under trial:—Buddah, 32 bus. 20 lb. (112.9 per cent.); Gidgee, 32 bus. (135 per cent.); Kiah, 30 bus. 35 lb. (101.3 per cent.); Belar, 28 bus 25 lb. (151.3 per cent.); Mulga, 28 bus. 25 lb. (100 per cent., standard variety); Palestine, 22 bus. 20 lb. (96.4 per cent.); Fulghum, 21 bus. 20 lb. (119 per cent.); Kelsalls, 15 bus. 20 lb. (88.6 per cent.); Laggan, 13 bus. 20 lb. (48 per cent.).

Gidgee lodged slightly in the heavy patches, while Palestine lodged fairly badly, but under good conditions would have been one of the best yielders. Belar's high position in the table of yields is due to the fact that it stood well and was easy to strip. Kiah produced easily the best and plumpest sample of grain, and is ideally suited for feeding to stock. The wind did great damage to Laggan and Kelsalls. Before lodging both these varieties were estimated to yield about 30 to 32 bushels. Fulghum is too late for the Trangie district, and in addition is only a moderate yielder.

Orchard Notes.

MAY.

C. G. SAVAGE AND H. BROADFOOT.

Harvesting of Late Apples.

IN the later districts many varieties of apples have yet to be harvested, and proper care must be given to the various operations incidental to marketing. The main points in packing are to grade for size and quality, use a good clean case, wrap good fruit, pack tightly and to finish the case neither too high nor too low. Wiring of cases is strongly recommended, and when stacking cases it is advisable to see that they are stacked on their sides—not on the bulge.

Pruning.

Where large areas of trees have to be handled it is advisable to make an early start with the work of pruning and so give a longer season. Too many instances occur when the pruning is delayed, with the result that the grower finds his ploughing put off till too late (at grave risk of losing moisture just when it is required), and it may interfere with his spring spraying.

The chief aim when pruning young trees is to develop a strong well-shaped frame. In years to come the tree must bear a burden of fruit, and to do this it must be so treated that it will have sturdy limbs. If limbs are allowed to weaken by excessive, unchecked growth, and to commence cropping whilst the limbs are too fragile to bear the weight of fruit, results may be disastrous. It will be most unsatisfactory and unprofitable to a grower to harvest a good crop of fruit from trees if that crop has been produced at the expense of the well-being of the tree. If young trees are carefully selected and then sturdily built up, the subsequent cropping must be satisfactory. When a good framework has been induced, and if the tree is still growing vigorously, it is usually advisable to allow the tree to remain unpruned for a season; this will induce it to crop.

The characteristics of the tree must, of course, be taken into consideration. For example, peaches bear only on last year's growth, and, unlike the apple and pear trees, do not develop fruit-bearing spurs. In old apple and pear trees these fruit-bearing spurs sometimes need thinning out to prevent their becoming too crowded. Factors which influence the growth and development of trees, such as soil, location, character, and influence of stock, manuring cultivation, and spraying, all play their part in deciding the extent and nature of the pruner's operations and prevent any rigid rule being laid down.

Preparations for Planting Deciduous Trees.

Where the land has been ploughed and subsoiled some time previously, it will probably now only need working up with harrows and cultivators to put it in condition for planting, though in some cases a cross-ploughing may be advisable first. In all cases an endeavour should be made to finish with a deep-stirring implement that will bring the clods to the top and allow the finer soil to remain underneath. A cloddy surface allows the rain to enter the soil much more freely than a fine one, and provides a mulch to reduce evaporation of moisture.

Trees supplied from the nursery should not be accepted as a matter of course or subjected to only cursory examination, but they should be looked over most carefully, and diseased, insect-infested, or ill-developed trees should be cast aside. Those which are fit for planting should then be placed in a trench and their roots should be covered with fine moist soil from which they can be removed for planting as required.

The Square or the Hexagonal System of Planting?

There is sometimes contention whether the square or hexagonal system of planting should be followed, and it is doubtful whether the point will ever be decided. The hexagonal system certainly does offer three main ways of working, against only two ways in the square system, and sometimes this has a distinct advantage on steep hillsides. However, it is unwise to rely solely upon this, and on such hillsides it is far wiser to lay out in blocks, altering the direction of the rows according to the contour in each block.

Given the same distance between trees, more trees are accommodated in a given area by the hexagonal method than by the square method, but it is wiser to base the number of trees per acre on the carrying capacity of the land and other conditions, and to adhere to that number whatever system of lay-out is adopted. For instance, if it has been found under certain conditions that certain trees are satisfactory when planted 24 feet apart on the square system (which, discarding fractions, gives seventy-five trees per acre), and it is intended to plant more of such trees under similar conditions but on the hexagonal system, then it is better to space them at a distance that will give approximately the same number per acre, which means that they will be 25 feet 9 inches apart.

As already mentioned, when laying out an orchard on a slope liable to wash during heavy rains, the area should be divided into blocks according to the contour of the land and the direction of the rows fixed accordingly, so that the furrows left in ploughing or cultivating, when carried out in one direction, will carry the water they collect at an easy grade. Sufficient surface retaining drains should also be provided at an easy grade to prevent heavy flows of water over the cultivated ground. These drains should be made before planting, as too often when put off till later, serious damage is done before the work is carried out.

A leaflet on laying out and planting is obtainable, post free, from the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

Codling Moth.

Before turning to winter work the orchardist should put his packing shed in order. All receptacles such as cases or bags that have contained apples or pears during the season should be dipped in boiling water for not less than three minutes. Any packing shed appliances that cannot be dipped should be thoroughly searched for any codling grubs concealed therein.

Nursery Stock.

The wraps of all budded nursery stock may be removed any time now.

When Sowing Bleached Seed Wheat.

The suitability of rain-damaged grain for seed depends upon the amount of damage; for instance, it can be accepted that the germination capacity of slightly bleached wheat has not been appreciably affected, while that of "sprung" or "shot" grains has been materially reduced, as detailed elsewhere in this issue.

The rate of seeding of slightly bleached grain should be increased by a few pounds per acre, advises Mr. H. C. Stening, Chief Instructor of Agriculture, because during a wet harvest the grain becomes infected with mould spores, which, if soil conditions are not favourable for rapid germination, may result in the destruction of a proportion of the seed. It is also necessary, points out Mr. Stening, to give consideration to the fact that the weight of wheat that has been bleached is reduced, and that it will not flow through the runs of the wheat drill as rapidly as sound grain, and it is therefore advisable at the commencement of sowing to test the drill to ensure that it is sowing the correct weight of seed per acre.

Bleached grain, Mr. Stening points out, is just as liable to produce a bunty crop as sound grain, and it is therefore a very risky practice to neglect to treat it for bunt prevention.

Early and Late-sown Grain Oat Trials at Bathurst, 1930.

The results of these trials, which were continued at Bathurst Experiment Farm last year indicate the most suitable varieties of grain oats for both early and late sowing in the Bathurst district.

In the early-sown section of the trial seeding took place on 2nd May, using 40 lb. seed and 56 lb. superphosphate per acre. The plots were harvested on 11th December, with the following results (the figure in parentheses is the average percentage yield based on the yield of the standard variety Algerian for whatever number of years the variety has been under trial):—Bombo, 44 bus. 10 lb. (144.4 per cent.); Lampton, 35 bus. 17 lb. (128.5 per cent.); Guyra, 33 bus. (912 per cent.); Algerian, 30 bus. (100 per cent., standard variety).

Seeding of the late-sown varieties was completed on 27th May, 50 lb. seed and 60 lb. superphosphate being used. The plots were harvested on 11th December, with the following results:—Belar, 29 bus. 30 lb. (90.7 per cent.); Guyra, 28 bus. 30 lb. (100 per cent., standard variety); Gidgee, 28 bus. 10 lb. (66.4 per cent.); Burke, 27 bus. 20 lb. (85.9 per cent.); Fulghum, 26 bus. 30 lb. (73.3 per cent.); Kendall, 26 bus. 20 lb. (90 per cent.); Mulga, 24 bus. 10 lb. (77.6 per cent.); Advocate, 24 bus. (83.4 per cent.).

Poultry Notes.

MAY.

E. HADLINGTON, Poultry Expert.

HAVING regard to the fact that there have been many newcomers into the poultry industry during the past year, it is considered advisable to deal this month with more or less elementary, but important, matters in connection with the breeding season

Breeding Stock.

Those who are just making a start and intend to obtain breeding stock to hatch and rear their own chickens, which is the soundest method of starting, should not delay any longer before securing their requirements, as the birds should be settled down in the pens not later than the beginning of this month. This is necessary to allow them to become accustomed to their new surroundings and come on to lay in time to commence incubation early in June. It is desirable that the male birds should be placed in the pens a week or so before it is intended to save eggs for incubation. Although in most cases the eggs should be fertile after the birds have been mated four or five days, early in the season the fertility may not be satisfactory in so short a period.

In cases where the breeding stock is being selected from the home flock, the birds should be in the pens ready for a final picking over, which is always necessary to ensure evenly-balanced pens. Some of the hens which are not properly through the moult may not, of course, be in good enough condition for a final selection, but these can be dealt with later.

The main points to look for in selecting breeders were deal with last month, but there are a few factors which many beginners may be in doubt about. One question which is frequently asked is whether it is advisable to mate pullets and cockerels, and while this question can be answered in the affirmative, some qualification is needed, because it is essential that both cockerels and pullets be at least ten months old and well developed. On most farms it is necessary to use pullets and cockerels to obtain eggs for hatching early in the season, because usually the hens do not come on to lay early enough to produce early chicks, and frequently the second-year males are not in good enough condition at the beginning of the season to ensure satisfactory fertility.

Feeding the Breeders.

The feeding of the breeding stock has an important bearing upon results, and if they are given a high percentage of concentrates in the ration poor hatches may be expected. Breeders, therefore, should be given only about 5 per cent. of meat meal having a protein content of around 60 per cent., and if they have been receiving more should be reduced to that amount in the ration at least a month or so before the breeding season. The use of maize in the evening feed to the extent of one-third, or up to two-thirds if the price is comparable with wheat, is also beneficial for the breeders. Green food should be supplied daily, especially where there is no grass on the runs.

The birds should be given as much as they will eat of mash in the mornings and of grain in the evenings, but not so much as to have food left an hour after feeding.

Feed the Male Separately.

It often happens that the male bird allows the hens to eat up the food and does not get sufficient for himself, and consequently he becomes poor. When this occurs it is common to see the male rush ravenously for the food and it is thought that he is becoming too greedy, but this is a sure sign that he is being starved. The best way to avoid such a happening is to give the male bird a feed of whole maize at midday. This can be done by shutting the hens in the house and giving the male a handful of feed in the yard. It is a wise plan to handle the "head of the pen" every week or so during the breeding season to make sure that he is keeping in good condition, because neither good hatches nor strong chicks can be expected from poor males.

Keep the Birds Free from Vermin.

A practice should be made of treating the birds as soon as they are penned to free them of body lice, otherwise during the season the males particularly may become heavily infested, which causes them to lose condition, and bad hatching results follow.

A very effective method of eradicating these parasites is to paint a thin line of nicotine sulphate (40 per cent.) along the top of the perches a short time before the birds go to roost. A small brush similar to a paste brush will serve the purpose. The fumes from the nicotine penetrate through the feathers of the birds during the night and banish the lice. It is advisable to repeat the treatment a week later to catch any further parasites which may have hatched out on the birds in the meantime. Occasional examinations should be made during the season to ensure that there is no fresh infestation.

Other methods may be adopted to get rid of these parasites, but all involve handling the birds individually. Flowers of sulphur dusted thoroughly through the feathers of the birds will prove effective, or a few pinches of sodium fluoride placed on different parts of the body, particularly around the abdomen, will serve the purpose.

Red Mite.

It is also essential to keep the houses free from red mite, but these parasites have to be dealt with in an entirely different manner to the body lice, as they are bloodsuckers and nocturnal in their habits, and in the daytime secrete themselves under the perches or in any crevices nearby. The name "red mite" is misleading to many beginners, because the mites may be found in three different colours. They are only red after they have engorged themselves with blood, but commonly they are grey in colour, and, when young, are white.

Painting the perches occasionally with wood-preserving oil, creosote, residual oil, or even the waste oil from motor cars, will usually keep the pest under control. It is advisable to do the painting early in the day and allow the perches to stand end up outside the pens so that they will not be wet when the birds go to roost.

When the mites are found in the walls of the houses and in the nests, &c., it is necessary to spray the houses thoroughly, and about the cheapest and most effective spraying solution is kerosene emulsion. This should be sprayed with a force pump into all the crevices both inside and outside the house, also the roof, floor, and nests. Where the infestation is a bad one it is often necessary to spray again a day or so later.

The emulsion is made by dissolving ½ lb. of soft soap in a gallon of boiling water, after which a gallon of kerosene is added, slowly stirring all the time and for a couple of minutes afterwards to ensure that the oil and soapy water are thoroughly incorporated. The mixture, called the "stock," is then added to 9 gallons of soft water and stirred well; it is then ready for use. It is also advisable to stir the solution occasionally while spraying.

The Record of Performance Scheme.

At the poultry branch of the University of British Columbia at Vancouver, of which Professor Lloyd is in charge, I saw during my recent visit to America some very good so-called "Australorps," which had a good deal of "Mulliner" blood in them and were above the average of our commercial flocks for type, yet not fluffy. Professor Lloyd is the champion of the Record of Performance Scheme, and a good deal of recording is carried out at the University in connection with fecundity experiments and genetic work. After hearing of the working of the R.O.P. scheme and seeing some of the farms of members I am convinced that much good must result to the industry, even more perhaps from the supervision exercised over the operations of members than the effect upon production.

Briefly, the Record of Performance and Registration Scheme is under the direction of the Poultry Division of the Live Stock Branch of the Canadian Dominion Department of Agriculture, whose inspectors carry out inspections of the stock of the members, and the rules and regulations are laid down by an association of poultry keepers known as the Canadian National Poultry Records Association.

Entries are received by the Department of Agriculture and entry fees are charged according to the number of birds entered, the amounts being £3 3s. for fifty birds, £5 5s. for 100 birds, £8 8s. for 200, and £1 5s. for each fifty over 200 birds. All birds entered must be healthy, free from standard disqualifications, and of good physique, and upon being handled by the official inspector are banded with a sealed band and trap-nested on the farms of their owners. The inspector makes unannounced inspections, and if after inspection of the records he has any doubt as to their accuracy he may take charge of the nests for a time sufficient to check the records. In the event of any attempted fraud, or if any of the regulations are not being observed, the entry may be cancelled, and no appeal is allowed. At the end of the record period the owner of the birds is required to take an affidavit that the records are correct.

Certificates are issued for birds laying 150 eggs or over in 365 days, and advanced certificates for those laying 225 eggs or over in the same period.

In addition to the recording of production there is also a scheme of approval of cockerels bred from recorded hens, under which such cockerels, if they come up to requirements upon inspection, are banded with a sealed ring, and are known as "Approved R.O.P. Cockerels."

These schemes have been in operation for ten years, and a register is published each year giving particulars of birds entered and their performances.

A system of hatching approval was instituted last year, and conditions are provided covering the approval of stock, sanitary conditions of the hatchery, class and weight of eggs for incubation, purchase of eggs, sale of chickens, etc. The rules and regulations were drawn up by the Department in consultation with the Canadian Baby Chick Association. The charges are approximately £2 15s. per day for members of the Baby Chick Association for inspection of flocks, or 2½d. per bird, the total charge not to exceed £2 15s. per day, and for non-members of the association double the amount.

These schemes have been instituted in an endeavour to improve the quality of poultry flocks, and with effective inspection should help to achieve that object.

CINCTURING CITRUS TREES.

IN outlining an experiment to test the value of cincturing citrus trees, Mr. D. D. Brown, Citrus Supervisor, explains in the Victorian *Journal of Agriculture* why the practice is resorted to. He says: "The theory is advanced that all plant food in liquid form is absorbed by the root hairs and by a system of osmosis is diffused through the minute vessels in the wood to the various parts of the tree, ultimately reaching the leaves, where it is utilised. The leaves, with the assimilation of the carbon dioxide of the air, throw off oxygen, and, retaining the carbon, manufacture elaborated substances through the agency of the chlorophyll and sunlight. These elaborated substances are in turn taken down to the roots through the cortical layers, thus making the action between leaf and root reciprocal. Any injury, therefore, to the cortical layers deprives the roots of return food as long as the wound remains open, and such elaborated substances are instead utilised in the formation of fruit. All fruit in normal trees is the product of excess elaborated substances over root requirements. If the roots are obtaining more than their share, the trees grow very strongly at the expense of the crop."

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1st *June*, 1931.

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VOL. XLII. PART 6. JUNE 1, 1931.

Agricultural Gazette of New South Wales.

The Second Bathurst Conference.

PRODUCERS AND CONSUMERS DISCUSS MARKETING PROBLEMS.

BELIEVING that the solution of the present-day problems that confront the farmer lies in the direction of better organised marketing of primary products, the Hon. W. F. Dunn, Minister of Agriculture, in pursuance of the pre-election policy speech of the Premier, the Hon. J. T. Lang, convened the Second Producers and Consumers' Conference, which was held at Bathurst (the venue also of the first conference, held in 1926), from the 12th to 15th of last month.

Hon. W. F. Dunn Opens Proceedings.

Proceedings were officially opened by the Minister of Agriculture, who referred to the unusual and critical nature of the circumstances in which the conference met. While seasons had been largely favourable, markets for primary products had been, and were still, very unsatisfactory, while consumers, equally with other sections of the community, were passing through a period of unexampled trial and stress. "It is essential, therefore," he said, "that we seek counsel together and, in a spirit free from party rancour, look for solutions to the problems that come within the ambit of this conference."

He invited the delegates to "co-operate with each other and avail themselves to the full of the opportunity to recommend to the Government measures calculated to improve the marketing of primary products, and thus materially improve the conditions of the producers, on whom the future prosperity and well-being of the country depend.

The Premier Urges Co-operation.

Of all the problems which confronted the conference, said the Premier in his address at an evening session on the opening day, nothing was of more importance than the position of the wheat industry. No other primary industry was so threatened by world conditions. Between this and next harvest wheat-growers had to furnish themselves in such a way as to be able to meet the threatened competition from Russia, Canada, and other wheat-producing countries. There was only one way in which they could work—and that was by true co-operation among all producers.

"You must," he said, "be supported by your home market, in which you must receive a guaranteed price well above the export value of your products. There must be sufficient profit from your Australian sales to even up the return which you receive from the exportable surplus. The Government has promised the fullest assistance in any marketing scheme along these lines. It proposes to bring in legislation to achieve this end, but before that legislation is drawn up we look to this conference for advice and assistance."

Another important aspect of primary production with which the Government was concerned, said the Premier, was the meat export trade, which should be one of the mainstays of the men on the land, but which was becoming one of their most decadent industries. New South Wales had the land, it had the stock, and it had men quite as competent to tackle this problem as had any other country. What it had lacked so far had been co-operation among the growers.

It could not be impressed upon farmers too strongly that their only hope of salvation lay in a sound and proper system of co-operation, and that could be all-sufficient if supported and aided by a sympathetic Government.

Conference Procedure.

After the general opening session, the gathering divided into sectional committees representing the interests of both producers and consumers. Under this system the representatives elected on behalf of each primary industry constituted the committee for that industry, and in order that a balanced view of the various problems might be taken by each committee, a consumers' representative sat on each producers' committee and a producers' representative on each consumers' committee.

Producers' committees numbered thirteen and consumers' committees four. In addition there were an executive and a co-ordinating committee and two special committees which dealt with transport and with city marketing facilities, respectively.

The determinations of these sectional committees were submitted for the endorsement of the full conference, which assembled for that purpose on the last day of the proceedings.

Co-operative Marketing Endorsed.

The outstanding feature of the conference was the attitude of the committees towards compulsory co-operative marketing. Those committees representing producers whose produce is now handled by a marketing board, definitely endorsed the present system of compulsory marketing under the control of marketing boards, while the representatives of producers who are not yet so organised, indicated in a number of instances, that they favoured steps being taken with the object of bringing about this form of organisation.

At the instance of the Cattle, Sheep, Fat Lamb and Wool Committee a resolution was passed at the full session of the conference in favour of preferential Empire trade.

The Organisation of the Conference.

The whole of the organising work incidental to the conference was carried out by the State Marketing Bureau (of which Mr. A. A. Watson is the Director), a branch of the Department of Agriculture Both the Minister and the Under Secretary for Agriculture (Mr. G D Ross) expressed their entire satisfaction with the arrangements made and their conviction that the value of such a conference had again been clearly demonstrated.

It is the intention of the Department to issue a report containing a full account of the proceedings of the conference.

The Outlook for Wheat.

[Continued from page 345.]

E. S. CLAYTON, H.D.A., Senior Experimentalist.

IN the first instalment of this article, which appeared in last month's issue of this *Gazette*, the main factors affecting world production, consumption, and price of wheat were dealt with in detail. An explanation was given for the present low price of wheat, while the future of the industry was also discussed.

Russian Production.

The reappearance of Russian wheat on the world's market has caused such concern to Australian wheatgrowers as to warrant some discussion.

Prior to the War Russia's production was increasing rapidly, and after supplying local needs there was an exportable surplus of about 165,000,000 bushels a year. At this time no great use was made of the large areas of semi-arid land in the Steppes, now believed to be adapted to grain production under recently developed "dry farming" large scale methods.* After the War, Russian production improved, but internal consumption of wheat also increased rapidly.

Export ceased during the War and Russian Revolution, but revived in 1926. In 1927, 49,000,000 bushels were exported, but after that exports fell away again, and in 1928-29 Russia actually had to import wheat. In 1930 Russian wheat again appeared on the export market.

The following table shows the area of first- and second-class wheat lands in the United States and Russia:—*

United States.—First-class soil, 99 million acres; second-class soil, 135 million acres.

Russia.—First-class soil, 482 million acres; second-class soil, 371 million acres.

The possibilities of Russian production, so far as the area of first-class land is concerned, are simply colossal. The realisation of these possibilities now depends upon the success of the agricultural policy of the Soviet Government. Can the necessary economic stimulus be provided to ensure large scale efficient production and marketing under Russian political conditions? Soviet authorities estimate that the population will increase by 12 per cent. from 1928 to 1933. It is proposed to increase the production of grain crops by 50 per cent., and an increase of 35 per cent. in yield per acre by 1933 is expected as a result of the modernisation of agriculture. The underlying idea of the Five-year Plan in agriculture is the mechanisation of production, which necessarily means large-scale operations; hence the intensive campaign of the Soviet Government for the collectivisation of peasant holdings. Peasants and their holdings are being collected together so that their operations can be controlled and production increased by collectively operated machinery.

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* "Russia and the United States in the World's Wheat Markets," by Dr. C. F. Marbut.

Another means of increasing wheat production is by mechanised State-owned farms or giant grain factories. These large wheat farms are established on rich virgin, gently rolling lands, of which millions of acres exist in a more or less unoccupied state. Official surveys indicate that 75,000,000 acres of country are available for large State farms, but this area includes the northern timbered regions where wheat is not grown, the desert, the mountain border country of Turkestan, as well as the great grain belt. After excluding all areas considered by the experts as being unsuitable, an area remains of 60,000,000 acres of good country situated in the region where high-grade export wheat can be produced.

In Russia the naturally productive soils occur chiefly in the semi-arid region, which is the region where high-quality wheat is produced. To the north of this belt the soils are not very suitable, and south of it, except for small strips, is mountain or desert.

The State wheat farms definitely planned cover an area of about 25,000,000 acres; about 2,500,000 acres of grain were sown in 1930. The largest State farm, "The Giant," situated a few miles from Salsk, is 427,000 acres in area, and 280,000 acres of grain were grown in 1930 and all harvested in good condition, the total yield being 3,865,000 bushels of grain, which amounts to about 14 bushels per acre. These figures of the 1930 yield are by Louis Fischer. Dr. Marbut, of the United States Department of Agriculture, who visited this farm in 1930, considered that the yield on portion at any rate of this crop would be nearer 18 bushels per acre. In 1929 on this farm the crop, although injured by drought, yielded 12 bushels per acre. The cost of production in 1929 on "The Giant," as quoted in the Government report, was about 3s. 4d. per bushel. The 1930 cost is not yet definitely known, but is officially estimated at 2s. 1d. a bushel. On the Verblud Farm, near Rostov, the cost per bushel was said to be 3s. 1d. in 1930.

When in cultivation the total areas embraced in the State farms, already planned and in various degrees of operation, will produce, at the low average yield of 12 bushels per acre, a total of 300,000,000 bushels from government enterprise alone. The Five-year Plan arranges for the total area to be in production by the end of 1933. That considerable success has been achieved towards this formidable objective is obvious from the fact that the agricultural part of the plan is at this time of writing ahead of schedule. If the plan is successfully carried through, Russia in 1933 is likely to have a surplus of over 200,000,000 bushels of wheat for export.

The success of both the State grain factories and the collectivisation of the peasant holdings depends on the mechanisation of agriculture. We have only meagre information regarding the possibilities of success. The topography of the country favours the use of machinery on a large scale, the soil is extremely fertile, and the rainfall over large areas quite satisfactory. It is the Russian himself who has been and is the limiting factor in production. In agricultural methods he is years behind the times; in spite of wonderful natural resources it may still be found that the Russian may fail in the efficient application of large machinery and power to agriculture.

Initial success, while the machines and tractors are new and still under the supervision of numbers of American experts, should not unduly daunt us in Australia. During the past five years the United States has shipped about 39,000 tractors and 500 combines to Russia, and factories are being built in Russia to produce agricultural machinery. Whether Russia can produce wheat profitably by this means remains to be seen. The services of a number of agricultural experts have been secured to educate the peasants, and tremendous outlay of capital for tractors, machines, and factories for their local manufacture is involved in the plan, and with so much money invested it is only reasonable to expect that a great deal of effort and ingenuity will be directed towards making a success of power farming in Russia.

The whole scheme is an experiment on a colossal scale, and although the possibilities are tremendous, no one can prophesy what the ultimate result will be. One thing we do know, however, is that, whether the plan is wholly or partially successful, we will have to face the possibilities of greatly intensified competition in the production of wheat.

How Russian Success would Affect Australia.

The Russian Five-year Plan in agriculture is at present ahead of schedule; it is quite possible for it to be entirely successful. Achieving even partial success, the plan is likely to be followed by others still more ambitious. If Russia succeeds in producing export wheat in quantity the world would be over-supplied, and Australian and Canadian growers would have to face such low world's prices as to force them off the export market and into other avenues of production. This would leave Great Britain dependent on Russia for her wheat.

The necessity for Empire preference becomes increasingly clear as difficulties become greater. The problem of Empire preference could well be considered by Australian growers, for the possibilities and mutual advantages, especially to Britain, Canada, and Australia, are so great that the difficulties in the way of satisfactory adjustment, serious as they are, pale into insignificance.

How can Australian Growers meet Intensified Competition?

Even without the advent of Russia into the world's markets, the competition is likely to be extremely keen. Wheat is not only one of Australia's chief sources of income (second only to wool), but it is the chief means of support of the greater portion of our rural population. It gives employment to more people than any other single industry. Australia, therefore, is forced, of necessity, to make a success of wheatgrowing. To grow it successfully the cost of production must be reduced. Adjustments will have to be made to meet the altered world conditions of intensified competition.

In the United States winter wheat belt very interesting farm developments have occurred. There has been an increase in the size of many farms, facilitating the adoption of improved equipment and newer methods.

Although material increases have already been made in the size of family farms, the officers of the United States Department of Agriculture consider further increases probable and desirable.* By such means it is considered that acre costs can be lowered, yields increased, and costs per bushel reduced. The topography of the country in these areas lends itself to the maximum use of machinery on a large scale. Successful attempts have already been made in these areas to produce farm crops on a modern factory basis by complete mechanisation, and some very large "corporation" farms are in operation—the Campbell farm in Montana is well known.

Fortunately, in Australia the country in the wheat belt is level or gently rolling, and therefore permits of large-scale operations where big machines may be used. Fairly large machines are already in use, mostly operated by horses. It is possible that improvement in production efficiency is to be achieved by farming larger unit areas, and by much greater use of tractors and larger machines. If the solution lies in this direction, Australian growers are sorely handicapped by the high cost of power and machinery. It will be impossible for the Australian grower to develop much further along these lines of bigger machinery if he has to pay high prices, in the face of intensified competition on the world's wheat market.

The American grower already has a great advantage over the Australian in the matter of cost of machinery and tractors. Although at the present time it is considered that wheat can be produced here more economically with horses than with tractors, we should not ignore the great possibilities of power farming on a large scale, should power ever be available at a lower cost than at present. If horses are used the size of machinery is definitely limited, and if American and Canadian wheat power machinery continues to improve and develop as it has in the past ten years, we will be at a disadvantage in the matter of cost of production if we use horses exclusively.

The movement in Australia towards higher yields and the cutting of costs of production by better methods should be accelerated; there is now more necessity than ever for the application of knowledge and field research to agriculture The intelligence and ingenuity of Australian wheatgrowers will need to be very active to meet foreign competition successfully. In this connection the necessity for sowing a greater proportion of our wheat on fallowed land is worth stressing. It gives greater stability to wheat production and certainly lower costs. A smaller acreage is harvested to yield a given number of bushels, consequently reducing the sowing and harvesting costs. A substantial increase in the practice of fallowing is desirable, and this may easily be one of our main objectives in the fight to reduce production costs to meet foreign competition.

We have been told that wheat can be produced cheaper in Australia than anywhere else in the world. It is doubtful whether this was ever a fact, and at the present time we have no evidence supporting the statement.

***"The World Wheat Outlook, 1930." U.S.A. Department of Agriculture, Misc. Pub. No. 95.**

We have, however, ample proof that our costs of production are too high, and consequently low wheat prices hit Australian farmers very hard. The only way in which we can meet foreign competition on the world's wheat market is by lowering the cost of production. Although some reduction can be made by better farming methods, a good deal has already been achieved in this direction, and the costs are still too high. In a farmer's cost of production there are factors, other than farming methods, which have an important effect, and unless these are adjusted quickly he has scant hope of reducing his costs low enough to meet foreign competition. These factors, as well as those involved in improved cultural methods, demand immediate consideration and action if foreign competition on the world's wheat market is to be met successfully.

The collapse of the price in 1930-31, coming after two or three years of very dry seasons and short crops, has left the majority of the wheat farmers in New South Wales, Victoria, and South Australia in particular, in financially embarrassed circumstances. Only a small area was fallowed, and few preparations were made for this season's crop. This is a serious state of affairs, the full weight of which will not be felt until 1932. Prospects are not bright, and farmers are loth to incur the expenses associated with cropping. The seriousness of this position, not only as it affects the farmer, but also the State, cannot be overstated. If the wheat farmer, except those in favoured districts where diversification is possible, is ever to get out of his present precarious position and again become prosperous, and if Australia is ever to pay her way, wheat-growing must not be allowed to languish. If the present apathy persists, the 1931 harvest will see Australia with little or no wheat to sell, and the farmer and the State in a worse financial position than ever.

The wheat farmer has his back to the wall; he is in great need of assistance. His success or failure involves the whole country, and he must not, therefore, be allowed to fail. It is impossible to overlook the fact that Australia is forced to make a success of wheat-growing in order to maintain her population. As her need is so great, whatever stands in the way of economic production should be adjusted. It should be made possible for the wheatgrower to reduce his costs of production. During the process the industry must carry on. Although the outlook at present is not bright, anything is possible on the wheat market. It may easily happen that as a result of dry weather or disease the world's crops in 1931 may be short, and the price of wheat jump. We must be ready to take advantage of any such rise by continuing to sow a substantial area to wheat.

A Correction.

In the previous instalment of this article, when dealing with the world's price in 1930 (see page 343), the statement was made that Australia, from 1st December, 1930, to 31st March, 1931, shipped 55,000,000 bushels of wheat and 156 tons of flour, &c. The amount of flour shipped was 156,000 tons. Fortunately, the equivalent in bushels of wheat was given, and that was correct.

Steam Sterilisation of Soils.

WITH SPECIAL REFERENCE TO TOMATO GLASS-HOUSES.

C. J. MAGEE, M.Sc., B.Sc.Agr., Assistant Biologist.

THE commercial culture of tomatoes under glass has, during the past few years, developed into an important industry in New South Wales. With the extension of this specialised system of tomato-growing, many new problems have arisen in connection with the control of insect pests and fungous diseases, and growers are being called upon to give more and more attention to this phase of the work. Of special importance are the soil-borne diseases, particularly fusarium wilt and root-rot, which, unlike the foliage diseases, cannot be controlled by dusting or spraying with fungicides and necessitate the employment of special methods in combating them.

Unlike the outdoor crop, glass-house tomatoes are, of necessity, grown year after year on the same land, and the risk of carry-over of diseases and insect pests from previous crops is much greater than where crop rotation may be practised. At present many glass-house soils, after two or three seasons under tomatoes, are so heavily infested with soil-inhabiting parasitic fungi and eelworms as to be almost useless for the cultivation of this crop. The sterilisation of such heavily-infested soils by steam appears to be the only practical method by which they may be brought back again into profitable production, and the aim of the present article is to outline the simplest method of carrying out this treatment.

Rids the Soil of Diseases and Pests.

Soil sterilisation is undertaken primarily as a means of ridding the soil of disease-producing organisms, but it is of value also for the destruction of soil-hibernating insects and of weed seeds. In addition, the physical quality and fertility of many soils are improved by sterilisation, but it should be pointed out that over-heating or prolonged heating has the opposite effect and will render a soil unfit for plant growth. It is usually noticed that a temporary retardation of seed germination and seedling growth follows steam sterilisation. This effect is attributed to the over-production of ammonia in the soil, and disappears generally in two or three weeks. It is important to realise that improper sterilisation or careless handling of the soil after treatment will yield unsatisfactory results, and will not repay the labour involved.

Certain precautions should be observed, particularly in regard to re-contamination. If all the organisms in the soil are killed by steaming and a disease-producing organism is again introduced by careless handling, it frequently develops faster than if it has to compete with the myriads of organisms which make up the normal soil flora. It is therefore almost useless to sterilise the soil, and then walk over it soon afterwards with contaminated boots or cultivate it with implements previously used on untreated soil, or in any other way transfer to it infested soil or water.

Combats Fusarium Wilt and Root Knot.

The most important soil-borne tomato disease under New South Wales conditions is Fusarium wilt. This disease, due to the invasion of the roots and stems by the parasitic fungus *Fusarium lycopersici* is discussed in detail in *Plant Diseases Leaflet* No. 47, which may be obtained free from the Department. This fungus is a soil-inhabiting organism, which may live over in the soil from one season to the next, and has been known to survive in soils that have not been planted to tomatoes for several years.

Under outdoor conditions payable crops may be obtained from land heavily infested with Fusarium by growing wilt-resistant varieties such as Marglobe, Marvelosa, and Marvana, but up to the present no variety has been found which is at the same time wilt-resistant and suitable to our glass-house conditions.

Root knot (see *Plant Diseases Leaflet* No. 38) is due to the invasion of the roots by a minute parasitic eelworm. It resembles Fusarium wilt in that once the parasite is introduced into the soil it may remain there for many years, even in the absence of tomatoes.

Fusarium wilt and root knot may be introduced into virgin land by infected seedlings, contaminated farmyard manure, drainage or irrigation water, and by any method by which infested soil may be introduced. Both diseases are most destructive on light sandy soils, and it is on this account that they are so prevalent in the Warriewood and other districts on the Narrabeen Peninsula, where tomatoes are grown under glass.

Methods of Sterilising Soil.

There are two principal ways in which soil may be sterilised, viz., (1) by chemicals, and (2) by heat.

The chemical sterilisation of soil has, up to the present, not proved as successful as the heat treatment methods. Readily volatile chemicals such as formaldehyde and acetic acid are usually employed, and while their use in the treatment of small areas of soil has often been successful, they have usually given only indifferent results in large scale operations. Experiments and observations made by the Department during the last two seasons in the Warriewood district indicate that their use in the treatment of glass-house soils does not repay the expense and labour involved, although they may be of great value in the treatment of soil in seed boxes and seed-beds where the work can be done more thoroughly and greater precautions taken against re-contamination.

Various methods of heat treatment have been devised, either for roasting or steaming the soil, but of these few are adapted to use under New South Wales conditions. The inverted steam pan system possesses many advantages over other methods, and will be the only one discussed here.

The method consists simply in placing a large pan over the soil in an inverted position and passing steam under pressure into the pan, in order to force it into the soil underneath (Fig. 1). Suitable equipment is necessary for the sterilisation of soil by this method. The steam boiler is the most important and expensive item, and in addition, one or more steaming pans together with connecting fittings and steam hose are required.

Boiler and Steam Pan Required.

The steam boiler should preferably be of the portable type, and should be of sufficient capacity to supply the required quantity of steam for the size of pan used. A boiler of at least 20 h.p. capacity is necessary for a steam pan 72 square feet in area. The larger the boiler the more easy it will be to maintain the desired steam pressure. Steam boilers of obsolete type may occasionally be purchased second-hand from engineering works and other such places, and can be adapted to meet the needs of the glass-house man. The second-hand purchase, however, should only be made after the boiler has been inspected by a competent boiler engineer. In a glass-house community the burden of cost of the boiler and other equipment may be shared by two or more growers who agree to work on a co-operative basis, or the owner of a portable boiler may contract to perform the work of sterilisation at an agreed price for a given area.

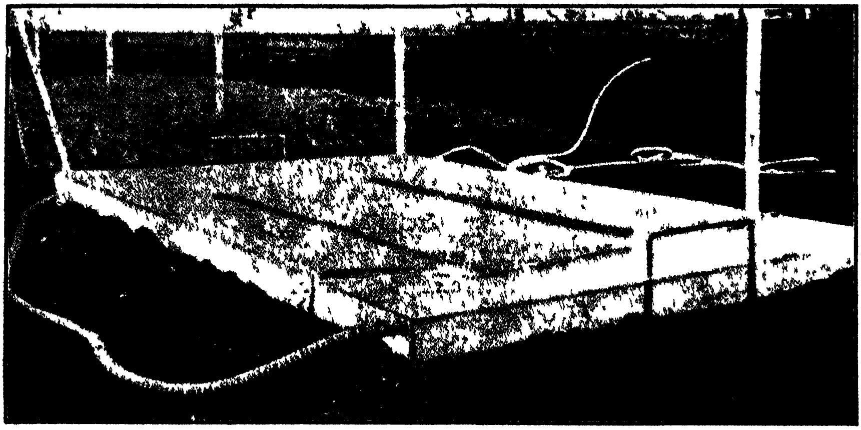


Fig. 1.—Type of Inverted Pan Used for Steaming the Soil.

[*After Chupp.*

The steam pressure in the boiler should be maintained at about 70 to 80 lb. per square inch during steaming in order to furnish the required quantity of high-temperature or dry steam. Dry steam reduces the rate of water-logging, and thus favours the penetration of the steam into the soil.

The steam pan may be made of moderately heavy gauge galvanised iron reinforced with angle-iron, or durable lightweight timber may be used in its construction. The size and shape of the pan should be determined by the particular conditions under which it is to be used, and the capacity of the boiler which is available. It should be of such dimensions as to fit conveniently between the panels of the house. A pan having an area of 50 to 75 square feet, and 8 inches deep is the size usually employed. The pan should not be too large or too heavy, otherwise difficulty will be experienced in working with it. Handles should be attached to the pan to aid in lifting it. The lower edge of the pan should be sharp, so that it may be pressed readily into the soil, thereby reducing the escape of steam at the point of contact with the soil. The inlet for the steam should be so placed that the steam is not thrown directly against the soil. The inlet pipe should be about ¾-inch in diameter, and sufficient steam hose will be needed so that all parts of the house may be reached without moving the boiler too frequently. It is a good plan to employ two steam pans, one of which is left in position on the freshly sterilised area to retain the heat, while the other pan is used in steaming the next area.

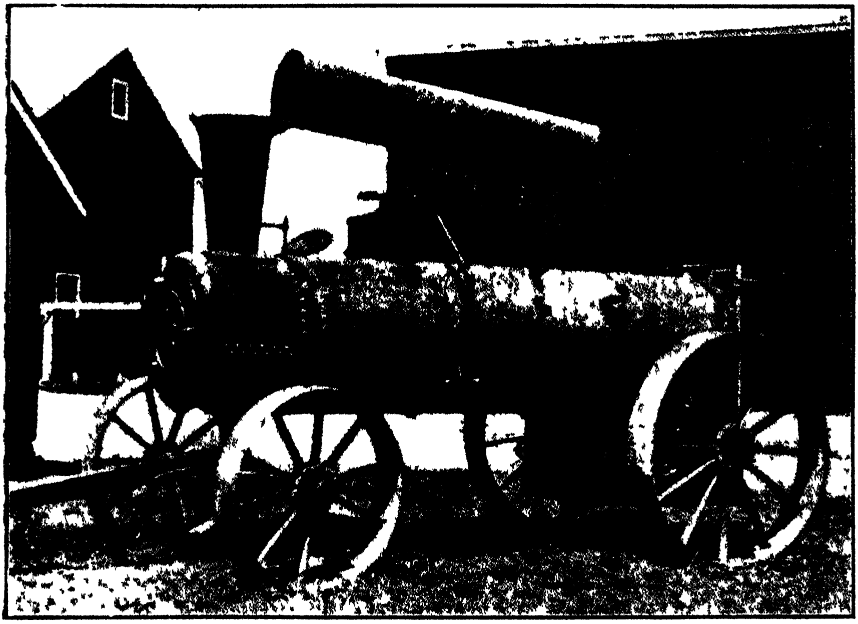


Fig. 2.—Portable Type of Boiler Adapted for Use in the Sterilisation of Soil.
[*After Johnson.*

Points for Consideration when Sterilising.

Steaming should be carried out at least a fortnight or three weeks before the seed is planted or young seedlings are set out. This permits of a partial or complete recovery of the soil from the effects injurious to seed germination or seedling growth. Certain preparation of the soil is necessary before steaming, both to allow better penetration of the steam and to reduce the amount of handling the soil must receive after sterilisation and before planting.

The soil should be neither too dry nor too wet, but of moderate moisture content. It should be well dug, and any farmyard manure that is to be applied should be worked in. Commercial fertilisers are best applied after steaming; due care being taken to guard against unnecessary contamination by soil or implements that have not been sterilised.

The time required to sterilise the soil thoroughly varies considerably, depending upon the type and conditon of the soil, as well as the efficiency of the equipment. On a sandy loam soil of medium water content, steaming from thirty to forty minutes at a boiler pressure of 80 lb. should suffice, but on heavier soils steaming may have to be continued for an hour or more. A practical method is in use to determine the length of time necessary for efficient steaming. A 5 or 6 oz. potato is buried about 4 inches below the soil surface under the pan, and steaming is continued until the potato is well cooked. It is possible to reduce the required time somewhat by the use of two pans alternately, thus eliminating the necessity of moving the pan immediately after shutting off the steam.

The work of steaming should be done systematically, starting at one end of the house and finishing at the other so that the steamed areas are not walked-over unduly.

These notes are presented in the hope that they may serve as a guide to glass-house men who are contemplating installing a steam sterilising plant. With necessary modification the method may be used with profit by nurserymen, tobacco growers or others, whose wish it is to free their seed-beds from weed seeds and damping-off fungi.

THE ANNUAL CONFERENCE OF THE AGRICULTURAL BUREAU.

THIS year's annual conference (the ninth) of the Agricultural Bureau will be held at Hawkesbury Agricultural College, Richmond, from the 21st to 24th July.

Accommodation will be reserved for one delegate from each branch, each sub-district council, and each district conference till the 30th June, after which date any available accommodation will be allotted to other delegates nominated by affiliated branches. In addition, accommodation will be reserved for fifty ladies.

A charge of £1 for accommodation will be made for each delegate. Secretaries should forward nominations and accommodation fees to the Secretary of the Advisory Council, Department of Agriculture, Box 36A, G.P.O., Sydney, as early as possible (*closing date 30th June*).

A suitable rotation for tableland potato-growers is hay or grain, clover, rape or peas, and then potatoes again.

Varieties of Wheat in New South Wales.

[Continued from page 387.]

J. T. PRIDHAM, H.D.A., Plant Breeder, and A. R CALLAGHAN, D. Phil., B Sc., B.Sc. Agr., Assistant Plant Breeder.

To date twenty-eight varieties have been described and illustrated in this series. These, in the order in which they have appeared, are:—Waratah, Federation, Yandilla King, Turvey, Canberra, Nabawa, Bena, Marshall's No. 3, Penny, Hard Federation, Union, Free Gallipoli, Nizam, Currawa, Gresley, Wandilla, Ranee, Riverina, Cleveland, Purple Straw, Aussie, Bomen, Major, Gluyas Early, Minister, Bald Early, Florence, and Clarendon.

In this, as in each previous instalment, the varieties are dealt with in the order of their relative importance in New South Wales at the time of writing

Early Bird.

Early Bird arose from the same cross as Canberra (page 13, January, 1931, issue); it is the earliest of the selections that were made from the cross.

It is erect in early growth and stools sparsely; these characters, together with light yield are inevitably associated with varieties of this type that have been selected for extreme earliness. The straw is medium-tall, white and slender, but rather weak; it is quite suitable for hay. The ear is white and tapering, with only short, minor tip-awns, the spikelets are very spreading and irregularly directed, the outer-glumes being medium-long with rounded shoulders The yellow grain is in the medium-strong flour class.

Early Bird is susceptible to flag smut, but on account of its earliness it often escapes infection from stem rust, although it is susceptible to this disease It is only suitable for the drier areas of the State, where short-seasoned wheats are preferred.

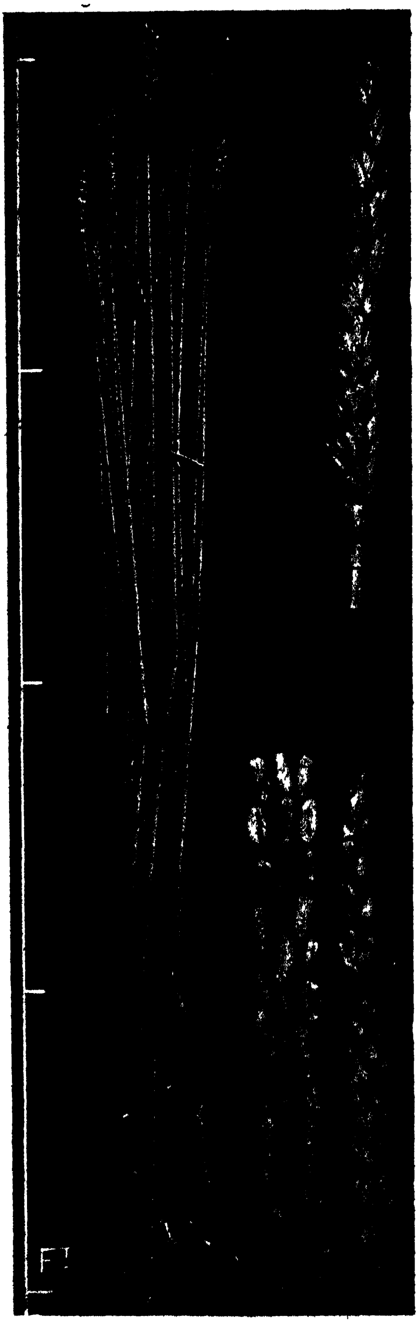
Steinwedel.

Steinwedel was found as a stray plant in a field of Champlain wheat in 1884, by a farmer in South Australia Prior to the advent of Federation, this wheat was grown extensively in New South Wales; at that time it acquired the reputation of losing a bag to the acre by shattering and even then yielding more than other varieties under dry conditions.

It has stout, rather tall, purple straw which bears a bold white, lightly clubbed ear with strong tip-awns. The grain is medium-sized to large, opaque, and in the soft white class.

Steinwedel's greatest defects are shattering and susceptibility to stem rust. It is early-maturing and drought-resistant; further the Improved Steinwedel is moderately resistant to flag smut; it has, however, been largely replaced by Bald Early and Bobin.

Steinwedel.



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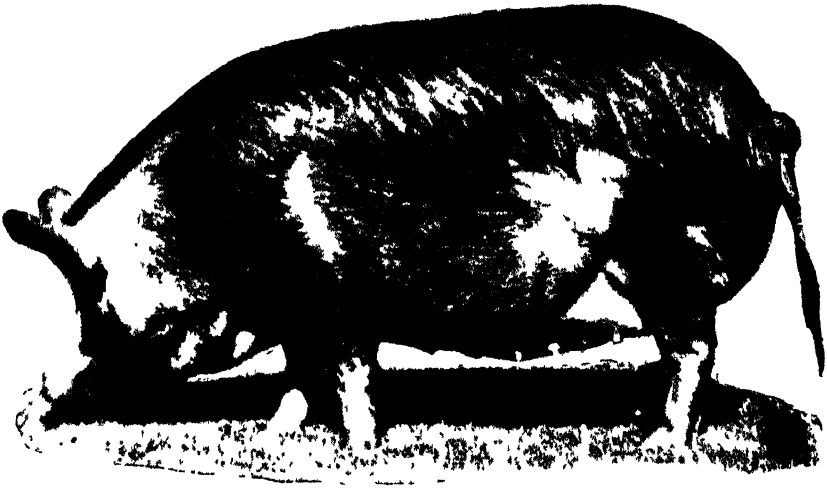

Tamworth Sow, "Inge Viola" (Imp.)

Stud pigs of **BERKSHIRE and TAMWORTH** breeds are available for sale at—

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Wollongbar Experiment Farm, Lismore.

BERKSHIRE pigs only are available for sale at—

Grafton Experiment Farm, Grafton.
Bathurst Experiment Farm, Bathurst.
Wagga Experiment Farm, Bomen.
New England Experiment Farm, Glen Innes.
Cowra Experiment Farm, Cowra.

Breeders are reminded that at the above institutions the studs have been augmented by importations of the best and latest strains available of Berkshire and Tamworth pigs from Great Britain.

Full particulars regarding prices, &c., can be obtained on application from the Principal, Hawkesbury Agricultural College, Richmond, or from the managers of the farms mentioned.

G. D. ROSS, Under Secretary, Box 36A, G.P.O., SYDNEY.

Comeback.

Comeback is one of Farrer's crossbreds which was in vogue for a time about twenty-five years ago, but is now grown chiefly for grain exhibition purposes. It is a variety of excellent grain quality, and from this point of view was regarded as one of Farrer's best wheats.

It is a Fife-Indian crossbred, which has white, slender straw of medium height, suitable for hay. The ears are long, white, tapering and quite bald. The grain is somewhat small, hard and flinty, belonging to the strong white milling class. It is an early-maturing variety, susceptible to both flag smut and stem rust. As millers do not give the premium for quality necessary to compensate farmers for its moderate yield, it is not grown to any extent.

Ford.

Ford was bred at Roseworthy College, South Australia; it has the long pedigree Fan x Comeback x Tardent's Blue x Zealand.

It is a dual-purpose midseason variety with tall, white medium-fine, strong straw. The ears of Ford are long, white and tapering with long conspicuous tip-awns. The outer-glumes of the spikelets are long and narrow, those situated low on the spike have rounded shoulders, and those towards the tip are square to elevated. The grain is large, yellowish-white, and usually very plump; it is grouped in the medium-strong flour class.

Although not bred specially for disease resistance, Ford has proved itself of distinct value in this respect. It is highly resistant to stem rust, resistant to flag smut, and it also appears to be resistant to foot-rot; it has also a reputation for resistance to bunt. As a defect, it has a slight tendency to shatter its grain. In South Australia, Ford has attained the position of third leading variety; it has gained favour there on new mallee soils because of its long straw which is a help at harvest time, and also affords a good stubble burn.

Gullen.

Gullen originated from a cross made in 1909 between Yandilla King and Zaff; the latter was selected from the Indian wheat Muzzaffar Negar for high flour strength.

It is a very early wheat with medium-short, slender straw. The brown, tapering ears have conspicuous tip-awns; the glumes are lightly pubescent, and the outer-glumes are long with elevated shoulders; these latter characters distinguish the variety from Waratah or Gluyas Early, both of which resemble Gullen superficially. The grain is yellow, hard and translucent, with excellent milling qualities; it is included in the strong-flour class. A sample of Gullen grown in New South Wales won a world prize for quality at Chicago in 1929; it weighed 67.6 lb. per bushel.

Gullen holds its grain well, and if anything is a little difficult to thresh. It is moderately resistant to flag smut, but rather susceptible to stem rust. Like most wheats of high quality, it does not yield very well, and unless millers are prepared to pay a premium for it, the variety is not likely to make much headway.

Queen Fan.

Queen Fan resulted from a cross between Fan and Carmichael's Eclipse, and was bred by the South Australian Department of Agriculture.

It has strong, stout, white straw, bearing white, dense, awnless, blunt-tipped to lightly-clubbed ears. The grain is in the weak-flour class.

Ford.

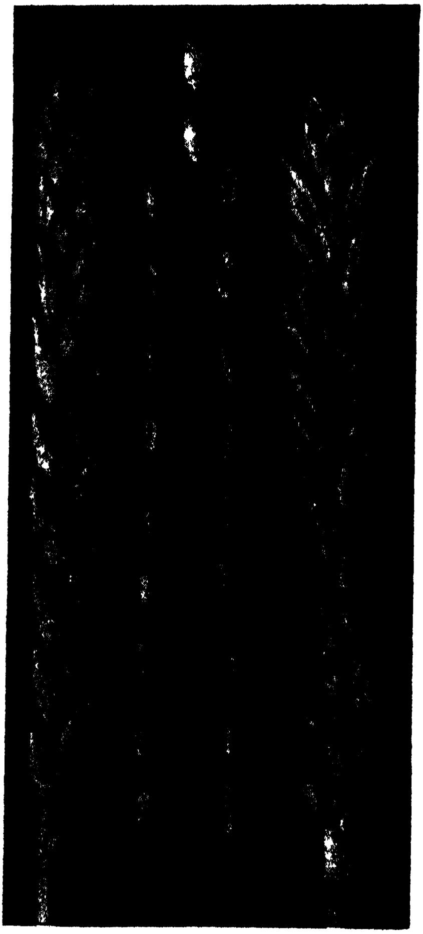
Gullen.

Queen Fan is rather susceptible to foot-rot, moderately susceptible to stem rust, but resistant to flag smut. It is a late-maturing variety that has fallen off considerably in popularity in South Australia; it had a certain vogue in the north-west of New South Wales a few years ago, but it has not gained much favour.

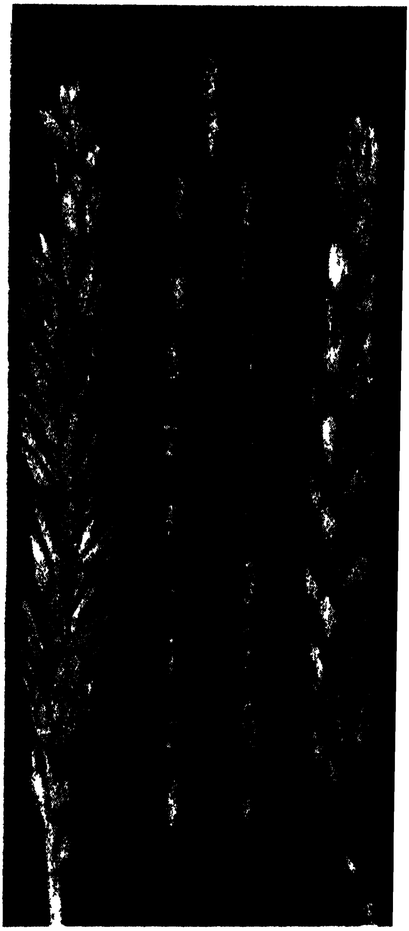
Caliph.

Caliph is another South Australian wheat bred by crossing Marshall's No. 3 with King's White.

It is an early-maturing variety with medium-tall, white, strong straw. The ears are white, tip-awned, long and tapering. The outer-glumes of the spikelets are long and narrow with predominately oblique shoulders; the glume characters afford a ready means of distinguishing Caliph from varieties such as Florence, Rymer, and Sultan, which appear somewhat similar in superficial characters. The grain is medium-size, opaque, and is included in the weak-flour class.



Caliph.



Pusa 4.

Caliph is susceptible to both flag smut and stem rust. In South Australia it is a popular variety, especially on the light sandy mallee soils where it does well; in point of acreage it occupies the seventh position in South Australia. In New South Wales it has not yet been fully tested, but it is grown to some extent in the Trundle district.

Pusa 4.

Pusa 4 was received from India in 1916. It originated as a natural cross-bred in the breeding plots of the Indian Government at Pusa, and is thought to contain some Federation blood.

It has short, white, slender straw bearing a white, open, tapering ear, which is awnless; the glumes are lightly pubescent. The grain is yellowish-white, hard and translucent; it is included in the strong white class.

Pusa 4 is now the leading wheat in Queensland; on account of its very early maturity it often escapes stem rust, though susceptible to this disease. Its resistance to flag smut and its better grain-holding capacity give it preference over Florence in these districts, though Florence is more inherently resistant to stem rust. It is grown to some extent in the north-west of New South Wales, where it rivals Clarendon in some localities.

UNSUCCESSFUL TRIALS WITH SHEEP BRANDING OILS.

BECAUSE of continued complaints from woollen manufacturers overseas regarding the losses caused by the use of tar for branding sheep, the Department of Agriculture commenced, some years back, trials at various experiment farms to determine the most suitable branding fluids both from the point of view of the sheep man, who must have a brand that remains legible from shearing to shearing, and also from the point of view of the manufacturer, who requires a branding fluid that is removable by the ordinary scouring process.

While fully realising that the manufacturers' complaints are perhaps justified, the Department has had no success as yet in finding a branding specific of the desired requirements. During the years that these trials have been in progress, all the proprietary branding specifics thought worthy of trial have been tested, as well as three branding preparations specially submitted by the British Woollen Research Association (England). In every case, however, the results have not been at all satisfactory in the opinion of the Department's Sheep and Wool Expert, Mr. E. A. Elliott. In brief, the trials demonstrated that the only branding specifics which would scour out of the wool after shearing were those whose permanency as a brand for identification purposes, under our climatic conditions at any rate, was practically useless.

The results of the trials with the British Woollen Research Association's preparations, which were specially submitted as being likely to solve our problem, should leave little room for doubt as to the difficulty of finding a branding material acceptable to both sheepman and manufacturer. In the first year that the association's preparations were under trial, the brands became rather indistinct before shearing time, and although they remained more legible during the second year's trial, in neither year was it possible to remove the brands entirely by scouring. To obtain confirmation of our results in this latter respect, samples of the branded wool of last year's trial have been forwarded to the Association for scouring, although it is not anticipated that their scouring process will be any more successful than our own in removing the brand.

A number of proprietary and Departmental mixtures are still under test.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney not later than the 12th of the month.

Wheat—

Aussie	Manager, Experiment Farm, Trangie.
	J. Parslow. "Cooya," Balladoran.
Baroota Wonder	Manager, Experiment Farm, Temora.
Barwang	Manager, Experiment Farm, Bathurst.
Bena	Manager, Experiment Farm, Bathurst.
Bobin	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Cowra.
Bruce	L. R. Harton, "Ferndale," Werris Creek.
Cadia	Manager, Experiment Farm, Bathurst.
Canberra	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Condobolin.
	Freudenstein Bros., Post Office, Tyagong.
	F. Penfold, "Bluevale," Boggabri.
Canimbla	Manager, Experiment Farm, Cowra.
Carinda	Manager, Experiment Farm, Bathurst.
Clarendon	C. Anderson, Swan Vale Post Office, *via* Glen Innes.
	J. Parslow, "Cooya," Balladoran.
Cleveland	W. Burns, "Goongirwarrie," Carcoar.
	Manager, Experiment Farm, Bathurst.
Currawa	Manager, Experiment Farm, Temora.
Duri	Manager, Experiment Farm, Cowra.
Exquisite	Manager, Experiment Farm, Cowra.
Federation	Manager, Experiment Farm, Temora.
Firbank	Manager, Experiment Farm, Condobolin.
Gluyas Early	Manager, Experiment Farm, Temora.
Gresley	Manager, Experiment Farm, Bathurst.
Gullen	Manager, Experiment Farm, Temora.
Hard Federation	Manager, Experiment Farm, Trangie.
	L. R. Harton, "Ferndale," Werris Creek.
Marshall's No. 3	B. J. Stocks, "Linden Hills," Cunningar.
Nabawa	Manager, Experiment Farm, Trangie.
	G. Hand, "Hill View," Narromine.
	H. McFadyen, "Lochbine," West Wyalong.
	Whitfield Bros., "Gamble," Binnaway.
	R. B. B. Gibbs, "Glenmore," Old Grenfell Road, Forbes.
	Manager, Experiment Farm, Condobolin.
	A. D. Dunkley, "Bon Lea," Brundah, Grenfell.

***Wheat*—continued.**

Nabawa	J. H. Harvey, "Kindalin," Dubbo.
	J. Parslow, "Cooya," Balladoran.
	R. Massingham, "Aylmerton," Binnaway.
	I. Berney, "Eurimbla," *via* Cumnock.
	B. J. Stocks, "Linden Hills," Cunningar.
	F. Penfold, "Bluevale," Boggabri.
Wandilla	Whitfield Bros., "Gamble," Binnaway.
Waratah	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Bathurst.
	T. W. Abberfield, "Wongo Creek," Alexander Park.
	G. Hand, "Hill View," Narromine.
	Manager, Experiment Farm, Temora.
	S. E. Nash, "Lockwood," *via* Canowindra.
	B. J. Stocks, "Linden Hills," Cunningar.
	E. Idiens, "Kangarooby," Goolagong.
	F. Penfold, "Bluevale," Boggabri.
Yandilla King	Whitfield Bros., "Gamble," Binnaway.
	Manager, Experiment Farm, Temora.
	S. E. Nash, "Lockwood," via Canowindra.
	B. J. Stocks, "Linden Hills," Cunningar.
	Manager, Experiment Farm, Cowra.
	J. Chamberlain, Box Flat, Marrar.

***Oats*—**

Algerian	Manager, Experiment Farm, Bathurst.
	C. Bennett, Forbes-road, Cowra.
	H. E. Ward, "Gwenvale," Parkes.
	E. D. Ogilvie, "Ilparran," Matheson, via Glen Innes.
Belar	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
	D. H. Deering, "Kurralta," Piambra.
	H. E. Ward, "Gwenvale," Parkes.
Buddah	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra
College Algerian	Manager, Experiment Farm, Bathurst.
Gidgee	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
Guyra	H. R. King, "Mangay," Kingsvale.
	Manager, Experiment Farm, Bathurst.
Lachlan	Manager, Experiment Farm, Temora.
	H. McFadyen, "Lochbine," West Wyalong.
Mulga	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
	C. Bennett, Forbes-road, Cowra.
	H. E. Ward, "Gwenvale," Parkes.
Sunrise	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
White Tartarian	E. D. Ogilvie, "Ilparran," Matheson, via Glen Innes.
	Manager, Experiment Farm, Bathurst.

***Barley*—**

Cape	Manager, Experiment Farm, Bathurst.

***Potatoes*—**

Factor	C. Barberie, Batlow.
	R. Quarmby, Batlow.
	C. Buchele, Batlow.

***Field Peas*—**

Black Eye	H. Garside, Dartbrook, Aberdeen.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Wheat and Oat Trials, 1930.

FARMERS' EXPERIMENT PLOTS.

Murrumbidgee Irrigation Area (Griffith End).

E. B. FURBY, H.D.A., Agricultural Instructor.

WHEAT and oat experiments were conducted during the 1930 season on the Irrigation Area and the surrounding dry area.

Seasonal Conditions.

Perhaps no previous season in the history of this district has been so disastrous as this one. There had been no rain of any consequence during the summer prior to cropping, while the early autumn was most unpromising for a satisfactory and timely seeding. It was not until mid-May that the first useful rains occurred, and these enabled seeding operations to proceed fairly satisfactorily, though somewhat late. From early June to the middle of August the rainfall was very good, and it certainly seemed that the long-looked-for change had arrived. Temperatures generally were very mild and the crop made particularly rapid growth. For the six weeks ending 4th October a very detrimental break in these favourable conditions occurred, which practically ruined every crop in the district, as they were then well out in head. This period of dry weather was again followed by a further wet period in October, which it was thought would revive the then half dead crops. A prolific second growth was the outcome, but even this failed in the absence of further rain to support it, and the main portion of the poor crop which was ultimately harvested came from the original growth in which the heads were particularly small, containing only four or five grains.

The wet spring really did more damage than good, as it left a trail of rust infestation and haying off of crops. On the Irrigation Area the damage from these causes was very prominent, particularly from haying off, though rust was not evident as on the dry area. The damage on the irrigated crops was brought about largely as the result of heavy rain following the spring watering. It was quite common to find crops which indicated yields up to twelve bags per acre fade almost completely away.

Further rains during the harvest caused additional damage to crops by seriously bleaching the grain, and in many cases causing it to sprout in the head.

The rainfall records at Griffith are given below:—

April, 1929, 204 points; May, 111; June, 36; July, 26; August, 144; September, 133; October, 77; November, 152; December, 161; January, 1930, 40; February, 4; March, 17; April, 34; May, 74; June, 215; July, 80; August, 232; September, 65; October, 412; November, 102; December, 492 points.

Total from July, 1929, to May, 1930, 862 points.

Total from June, 1930, to October, 1930, 1,004 points.

Wheat Varieties for Grain (Dry Area).

Yenda (A. J. Cruickshank).—Soil light red loam, under cultivation for a number of years; wheat 1928. Disc ploughed September, 1929, no further working owing to the dryness of the season and the lightness of the soil; sown with combine on 1st May; seed 60 lb., superphosphate 60 lb. per acre. Good germination obtained. Rust not particularly bad in these plots. Three varieties, Exquisite, Federation, and Union were a failure and not harvested.

Yenda (C. R. Harris).—Soil deep red loam, pine and box country; no previous crops. Mouldboard ploughed August, 1929, scarified immediately afterwards, 3 inches deep; combined after rain in October; no further working; seed-bed rather on the deep side when sown with combine on 17th May, 60 lb. seed and 60 lb. superphosphate being used. Good germination obtained and crop was well out in head before the September dry weather did too much damage.

YIELDS of Wheat Varieties for Grain (Dry Area).

Variety.	Yenda. (C. R. Harris.)	Griffith. (F Holt)	Yenda. (A. J. Cruickshank.)	Yenda. (T H Burcher)
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Cadia	......	......	6 19	......
Duchess	......	8 10	4 33	.....
Ford	......	......	4 37	6 8
Nabawa	15 32	8 40	5 32	.....
Ranee	......	.. ...	3 15	......
Union	7 32	......	......	6 8
Duri	14 50	......	......	......
Nizam	8 30	......	......	.....
Baroota Wonder	8 44	......	......	......
Exquisite	5 22	8 0	......	.....
Federation	5 17	7 30	......	......
Longerenong Federation ...	5 36	7 57	......	......
Waratah	......	8 55	......	......
Riverina	......	10 53	......	......
Bobin	......	9 47	......	......
Yandilla King	......	......	......	6 8
Currawa	......	......	......	5 21
Ponny	......	......	......	4 43
Bald Early	......	......	......	5 34
Gallipoli	......	......	......	6 57
Geeralying	......	......	......	4 43

Griffith (F. Holt).—Soil red loam, pine and yarran country; no previous crop. Mouldboard ploughed August, 1929, 3 inches; harrowed and springtoothed after rain in October; half of paddock again harrowed end of December; sown with combine with trailing harrows on 13th and 14th May, 60 lb. seed and 60 lb. superphosphate per acre being used; ground

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in very good condition when sown and a good germination obtained. Harvested end of December. Exquisite was the only variety which showed rust; all varieties were partly bleached, the quality of the grain being poor with the exception of Riverina, which had no second growth.

Yenda (T. H. Burcher).—Mallee soil; two crops of wheat previously sown, both of which failed and stubble was fed off. The only working was with the scarifier in April, which put the ground in good sowing condition. Sown with disc drill from the 28th April to the 27th May; seed 45 lb. and superphosphate 50 lb. per acre. Union and Geeralying were the only two varieties in which the grain was not pinched. All varieties had a large percentage of second growth. Rust was not a serious factor.

Griffith (McNamara Bros.).—This plot suffered considerably due to the drought and was not harvested. The one outstanding variety was Penny.

Wheat Varieties for Grain (Irrigated).

Yenda (J. Fuke).—Soil very heavy red gilgai of shallow depth; previously grown wheat and oats for seven years, last crop wheat in 1928. Land was disc ploughed in July, 1929, springtoothed in August and harrowed two weeks later; springtoothed after rain in October and watered early in February, and springtoothed lightly to kill weeds. Watered again in April and cultivated. Rain in May following the April watering caused ground to remain wet and to delay sowing. Sown on 25th June with combine, seed 60 lb. and superphosphate 60 lb. per acre. The crop was irrigated in the spring which did considerable damage as water killed off the crop in the gilgais. All plots showed a slight infestation of stem rust.

Beelbangera (S. H. Kelly).—Soil red loamy; under cultivation for cereal and summer crops for eight years; previous crop rice in 1928-29, the stubble of which was fed off with sheep. Land ploughed dry 3 inches in January, 1930; smoothed and springtoothed in March and watered on 22nd of that month; springtoothed on 15th April and sown with disc drill with trailing harrows on the 18th April, 60 lb. seed and 90 lb. superphosphate per acre being used; crop harrowed after rain on the 20th May. Crop given a heavy watering in the spring, followed by heavy rain; no serious damage done, however. Stem rust was prominent in this plot but the yield was not affected.

YIELDS of Wheat Varieties for Grain (Irrigated).

Variety.	Beelbangera. (S. H. Kelly.)		Yenda. (J. Fuke.)
	bus.	lb.	bus.
Major	31	18	21
Ford	36	49	19
Currawa...	26	52	18
Wandilla	30	30	15
Marshall's No. 3	23	4	18
Penny	23	24	18
Yandilla King	25	48	10
Improved Steinwedel	22	13	9
Baroota Wonder	24	42	......

Wheat Fertiliser Trials.

Wheat fertiliser trials were sown in conjunction with the variety trials on the dry area. Two of these trials were so poor that it was not considered advisable to harvest them. The following results were obtained from the three most promising plots:—

Superphosphate Per Acre.	Griffith. (F. Holt.)		Yenda. (T. H. Burcher.)		Yenda. (C. R. Harris.)	
	bus.	lb.	bus.	lb.	bus.	lb.
No fertiliser	8	18	2	47	9	13
45 lb.	10	16	5	12	14	16
60 lb.	10	0	5	34	10	29
90 lb.	8	25	5	34	12	57

An irrigated fertiliser trial was also conducted.

Griffith (T. S. Power).—Soil heavy red loam; no previous crop. Land broken up in spring of 1929 and left till April, 1930, when it was worked with the scarifier 3 inches deep and springtooth cultivated in May; sown with hoe drill on 10th June, 60 lb. of Marshall's No. 3 seed being used. This ground was not irrigated prior to sowing, but one watering was given in the spring. This watering was late, with the ultimate result that this trial was no better than those on the dry area. The following are the yields obtained:—

Fertiliser Per Acre.	Yield.	
	bus.	lb.
No fertiliser...	10	17
56 lb. superphosphate	9	31
112 „ „	10	37
140 „ „	10	17

A Rate of Seeding Trial (Irrigated).

This trial was sown in conjunction with the above fertiliser trial on Mr. Power's farm at Griffith under the same conditions; variety, Marshall's No. 3; superphosphate at 56 lb. per acre.

The yields were:—

Seed Per Acre.	Yield.	
	bus.	lb.
43 lb.	10	16
60 lb.	11	20
75 lb.	10	34
90 lb.	10	36

Wheat-for-Hay Variety and Fertiliser Trials (Irrigated).

Lake View (C. A. Long).—Undulating red loam cropped for past seven years, last crop oats in 1928. Mouldboard ploughed in October, 1929; disc cultivated late in December, watered early in March, disc cultivated late in March and again just before sowing; sown with combine on 27th May;

seed 70 lb. per acre and superphosphate 56 lb. per acre; the crop was irrigated in the spring and did not suffer from rust damage; Zealand was not harvested as the crop lodged badly and could not be picked up with the binder. It was estimated to yield over 3 tons per acre.

The yields were as follows:—

Variety.	Yield. t.	cwt.	qr.	lb.
Marshall's No. 3	2	8	2	18
Yandilla King	2	6	1	7
Improved Steinwedel	1	14	1	4
Wandilla	2	2	3	9
Turvey	3	1	0	14

A fertiliser trial was sown in conjunction with the above variety trial under the same conditions, the variety being Marshall's No. 3. The yields were:—

Fertiliser.	Yield. t.	cwt.	qr.	lb.
No fertiliser...	1	16	1	15
56 lb. superphosphate per acre	2	7	3	20
112 ,, ,, ...	2	13	1	20
140 ,, ,, ...	2	12	1	20

Oat Variety Trials (Irrigated).

Four oat variety trials were sown, but only two of them were satisfactorily harvested. Considerable damage was done to the oat crops by rain at harvest time; they were badly knocked down, resulting in loss of crop.

Beelbangera (Geo. Tyson).—Soil grey gilgai; last crop wheat 1927. Fallowed in August, 1929, and watered in February, 1930, and combined; watered again in March and sown with the combine with trailing harrows; seed at 60 lb. and superphosphate at 60 lb. per acre. A good germination obtained. Crop watered in the spring.

Yenda (J. Lyne).—Soil heavy red, slightly gilgai; no previous crops. Ploughed in May, 1929, 4 inches deep; springtoothed twice (August and December); watered mid-March; sown with combine 23rd March, followed by cultipacker and harrows. These plots grew wonderfully well and were eaten off with sheep twice up to 6th June. They were watered in the spring, and lodged badly, rust being very prominent in the fallen areas.

YIELDS of Oat Variety Trials.

Variety.	Yenda. (J. Lyne.)	Beelbangera. (G. Tyson.)
	bus.	bus.
Algerian	32	36
Palestine	14	....
Lachlan	22	18
Buddah	20	15
Mulga...	17	....
Guyra	....	15
Belar	26	....
Reid	....	10

An Oat Fertiliser Trial.

An oat fertiliser trial was harvested by Mr. Tyson with the following results:—

Fertiliser Per Acre.	Yield. bus.
No fertiliser	17
56 lb. superphosphate	20
112 ,, ,,	21
140 ,, ,,	21

Comments on the Trials.

Wheat Variety Trials.—Four out of the five dry-area trials were on light soil; the fifth was on heavy land and was a failure. The effect of time of fallowing did not show up in any of the trials owing to the seasonal conditions, but on the mallee farm of Mr. Burcher a crop of Waratah not in the trial gave an average yield from 40 acres of 10 bushels per acre, compared with a yield of 5½ bushels from the same variety in the experiment plot, the difference being attributed to the fact that the farm area had been ploughed earlier than the experiment area had been worked with the scarifier.

Among the varieties grown on the dry area, *Nabawa* has been more or less outstanding. This was noticeable also in general farm areas.

Riverina gave the highest yield on one plot. This variety was very early and had practically no second growth, while the grain was not pinched.

Geeralying, which was tried for the first time here, did not give a very high yield, but it appears to be a suitable variety on the mallee for late sowing. It has tall straw with a good type of head.

Of the late varieties on the mallee, *Currawa* appears to be a suitable variety under more favourable conditions. The grain from this plot was very good.

On the Irrigation Area a comparison of the yields from the two plots is interesting, the highest yields being obtained from the old rice land. The plots on the gilgai soil (Fuke) indicated greater yields than those obtained. This particular type of soil leaves much to be desired as a suitable soil for intensive irrigation practice. It is subject to too much loss through waterlogging.

Major was outstanding for yield and resistance to the adverse conditions. Over a number of years this variety, outside of experiments, has consistently proved its worth as a high yielder.

Ford, which was grown for the first time under irrigation conditions, attracted considerable attention, and will possibly be grown during the next season on a larger scale by many growers.

Improved Steinwedel could be eliminated as not being suitable for these conditions. It was weak-strawed and shed grain easily. Likewise for hay purposes it proved a comparative failure.

Turvey was the outstanding variety in the hay trials. It stood up well to the adverse conditions and can be sown with safety for this purpose.

Zealand in this trial grew wonderfully well, but proved to be too weak in the straw, and could not be satisfactorily harvested.

Fertiliser Trials.—On the dry area the application of superphosphate in quantities ranging from 45 lb. to 90 lb. per acre has generally shown a decided increase over the no-fertiliser plots, and although the individual yields vary considerably, it seems that once the 45 lb. application, which gives a decided increase, is passed, the yields gradually drop down again.

With the hay crop applications up to 140 lb. per acre have this year given pronounced increases over no manure, and a payable increase over the standard application of ½ cwt. per acre.

Rate of Seeding Trial.—The difference in the yields from the various sowings is not pronounced, except that 1 bushel per acre was shown to be ample for this late sowing with a late variety.

Oat Trials.—The pre-eminence of Algerian for irrigation conditions is again very striking. It is difficult to replace this variety for general farming conditions here. Palestine was tried as an early variety for grazing purposes and proved to be useless. It made very little growth and was very susceptible to rust. Reid, on the other hand, was too late maturing, and grew very tall and lodged badly. Guyra is one variety which grows fairly quickly that might be reasonably employed for grazing purposes. Lachlan shed its grain badly, but was otherwise a good hay variety.

Murrumbidgee Irrigation Area (Yanco-Leeton End).

H. J. DARGIN, Agricultural Instructor.

Variety trials with wheat and oats were carried out last year on farmers' properties at a number of centres on the Yanco-Leeton end of the Irrigation Area, as well as on the adjoining dry area.

The Season.

Adverse seasonal conditions were again experienced, as a result of which three plots on the dry area failed.

There was very little rain during the fallowing period, with the result that practically throughout the dry areas the fallows received very little working, there being less weed growth than usual owing to the dry conditions being accompanied by cool weather throughout the spring and in January. Under such conditions the working of the fallows was unnecessary and in many instances inadvisable. A number of farmers found it practically impossible to commence ploughing until September owing to the hard state of the ground.

Many dry area farmers delayed sowing in the hope that rain would come, but when it did not come by early May most of them commenced sowing.

The following rainfall registrations recorded at Leeton give a fair indication of the conditions prevailing throughout the district:—

On the Fallow.—June, 1929, 36 points; July, 21 points; August, 155 points; September, 151 points; October, 90 points; November, 136 points; December, 104 points; January, 25 points; February, 4 points; March, 61 points; total, 783 points.

On the Crop.—April, 36 points; May, 130 points; June, 175 points; July, 120 points; August, 198 points; September, 46 points; October, 249 points; total, 954 points.

Wheat Plots on the Dry Area.

Brobenah (E. McKenzie).—Soil red loam 9 to 12 inches deep, subsoil red clay to gravel; had grown two crops of wheat previously, last crop in 1928. Mouldboard ploughed 3½ inches mid-September, springtoothed end of October, harrowed end of December, sown with combine and harrowed on 21st April; seed 60 lb., superphosphate 60 lb. per acre. The seed bed was in excellent condition. All plots slightly affected by stem rust. The yields of Duri, Waratah, and Rajah were reduced slightly owing to shedding, Riverina owing to shedding and lodging, and Aussie owing to flag smut. Harvested on 14th November.

Fivebough (J. E. Williams, Farm 56).—Soil red loam 6 to 8 inches deep, subsoil red clay, old cultivation paddock, last crop oats in 1928. Mouldboard ploughed 4 inches mid-October, harrowed mid-December, springtoothed 6th June, sown with combine on the 11th June in moist seed bed and harrowed; 60 lb. seed and 60 lb. superphosphate per acre. Harvested 29th December. The yield of all varieties was slightly reduced by stem rust.

Fivebough (J. H. Trethewey, Farm 30).—Soil red loam 1 foot deep, subsoil red clay. Four crops grown previously, last crop oats in 1928. Disc ploughed 3½ inches mid-July, scarified full depth early October, harrowed mid-December, scarified end April, sown with a combine in good seed bed on 14th May, harvested 10th January; 60 lb. seed and 60 lb. superphosphate per acre. Yield of all varieties except Nabawa and Rajah reduced by stem rust, the grain being pinched.

Colando (A. D. Malcolm, Farm 1039).—Soil red loam 6 to 12 inches deep, subsoil red clay. Two crops previously, last crop wheat in 1929. Disc ploughed 3 to 4 inches August, 1928, combined March, 1929, sown with combine May, 1929—crop failed. Combined early April, 1930, sown with combine on 20th May using 60 lb. seed and 60 lb. superphosphate. The seed bed was in fair condition, but rain was badly needed. Harvested 30th December. Drought conditions prevailed throughout the season, second growth, stem rust and haying off reduced yields of all varieties.

Fivebough (Maybon Bros., Farm 49).—Soil light red loam, 1 to 2 feet deep, subsoil red clay to gravel; old cultivation paddock, grazing paddock since last crop (wheat) in 1915. Moulboard ploughed 3½ inches end of August, springtoothed early October, harrowed mid-November, springtoothed end November, springtoothed 13th May, sown in an excellent seed bed with drill on 17th May with 60 lb. seed and 60 lb. superphosphate per acre. Harvested 20th December. Yield of Bobin was reduced 6 to 8 bushels per acre owing to heads breaking off, and that of Hard Federation by 50 per cent. owing to flag smut.

Brobenah (T. C. Davies).—Soil red loam 9 to 12 inches deep, subsoil red clay; old cultivation land for past eighteen years, last crop wheat in 1928. Moulboard ploughed 4 inches end of June, springtoothed 14th August, harrowed early October, springtoothed mid-May, sown with a combine in excellent seed bed on 29th May using 60 lb. seed and 60 lb. superphosphate. All varieties received a severe setback during droughty conditions late in August and throughout September. Yields of Hard Federation were reduced owing to late growth and stem rust and of Aussie and Rajah owing to shedding. The yield of Rajah was further reduced by the presence of green trees in the plot. Harvested on 10th January.

Brobenah (G. G. St. C. Potts).—Soil red loam 6 inches deep, subsoil red and chocolate clay; land cultivated for past fifteen years, last crop wheat in 1928. Mouldboard ploughed 4 inches during July, springtoothed September, harrowed February, sown with combine in fairly good seed bed on 6th May, using 60 lb. seed and 70 lb. superphosphate per acre. Droughty conditions during August and September badly affected all plots. Yields of all varieties were considerably reduced owing to being left standing during wet weather for about two months after ripening. Yields of Rajah and Waratah were further reduced owing to shedding, and of Canberra by lodging. Harvested 17th to 19th January.

Wheat Plots on the Irrigable Area.

Leeton (Mrs. A. T. Edwards, Farms 367).—Soil red clay loam 4 inches deep, subsoil red clay and rubble; had grown three crops previously, last crop rice in the 1928-29 season. Disc ploughed 4 inches on 10th December, harrowed mid-January, sown with combine in a good seed bed on 4th April using 60 lb. seed and 60 lb. superphosphate per acre. Land was not watered prior to sowing. Harvested 14th December. Yield of all varieties was slightly reduced by stem rust. Growing plots were irrigated on the 15th September.

Murrami (C. K. Lynes, Farm 1457).—Soil grey clay loam 2 to 3 inches deep, subsoil grey clay; previously cropped twice with wheat, the last occasion being in 1928. Disc ploughed 4 inches deep in mid-September, sundercut 4 inches mid-December, springtoothed prior to irrigating in mid-March, springtoothed end of March, sown with a light hoe drill in moist seed bed on 10th April, using 60 lb. seed and 60 lb. superphosphate per acre. The growing plots were irrigated on 25th September, and a second irrigation was commenced on the 3rd October, but discontinued when rain set in. The yields of all varieties were considerably reduced by stem rust and haying off during hot winds early in November. The yields of Marshall's No. 3 and Cadia were further reduced owing to lodging, and in the case of

Currawa and Cadia through shedding badly. The plots were fed off during July and harvested on 27th and 28th December.

Murrami (H. L. Tooth, Farm 1081).—Soil grey clay loam (self mulching), 6 inches deep, subsoil grey clay; previously cropped with rice twice in succession, the last occasion being in the 1928-29 season. Disc ploughed 4 inches mid-February, scarified end February, irrigated 1st April, springtoothed 17th April, and sown with drill 21st April, using 60 lb. seed and 60 lb. superphosphate per acre. The seed bed was too moist owing to late watering. The growing plots were not irrigated. The yield of all varieties was slightly affected by stem rust, while Turvey and Canimbla were further reduced in yield by shedding badly. Harvested 3rd to 7th December.

Wamoon (Power and Whelan, Farm 403).—Soil red to grey clay loam 6 inches deep, subsoil stiff red and grey clay; cropped twice previously with wheat and once with rice, last crop rice in 1928-1929 season. Disc ploughed 4 inches during October, disc cultivated end of January, disc cultivated mid-March, irrigated 16th March, disc cultivated end of March and sown in moist seed bed 9th April, using 60 lb. seed and 60 lb. superphosphate per acre. Germination of all plots was only fair, but stooling was good. Growing plots irrigated on 2nd October. Rain fell immediately afterwards and all varieties showed signs of having had too much water. Yields of all varieties were greatly reduced by stem rust, that of Exquisite being further reduced owing to haying off during hot winds early in November.

South Gogeldrie (S. J. Hinton, Farm 1700).—Soil red clay loam 5 inches deep, subsoil red clay; land had previously grown one crop only (Sudan grass, 1929), which was fed off. Disc ploughed 4 inches early September, springtoothed full depth early in October, irrigated and sown with Sudan grass mid-October from which a very light crop resulted. This was eaten off by sheep, springtoothed full depth 1st March, springtoothed lightly on 20th March, sown with combine on 2nd May, using 60 lb. seed and 60 lb. superphosphate per acre. Yields of Nabawa slightly reduced owing to lodging, and of Nizam and Penny owing to flag smut. Growing plots were not irrigated. Harvested on 13th December.

Murrami (A. Kingham, Farm 1425).—Soil grey clay loam 2 inches deep; prior to rice it had been cropped once only—with rice during the 1928-29 season. Disc ploughed 3½ inches on 3rd December, irrigated end of February, disc cultivated 15th March, springtoothed 24th March, sown with a combine in moist seed bed on 7th April, using 60 lb. seed and 60 lb. superphosphate per acre. Crops were eaten off too heavily during June and July and never fully recovered. Yields of all varieties were greatly reduced by stem rust, Exquisite being very badly affected. Growing plots were not watered. Harvested 3rd to 10th December, rain interfering with operations.

Calorofield (F. Clift, Farm 1137).—Soil light red to grey loam 6 inches deep, subsoil red to grey clay; previously cropped twice, last crop rice in the 1928-29 season. Disc ploughed 4 inches end of December, irrigated mid-January, disc harrowed early May, springtoothed early June, sown with a combine on 28th June in a fairly good seed bed using 60 lb. seed and 60 lb. superphosphate per acre. Yields of Ranee and Waratah reduced slightly owing to water laying in a few depressions, and of Riverina owing to lodging. Growing plots were irrigated on 20th September. Harvested on 20th December.

Leeton (L. Snelson, Farm 383).—Soil red clay loam 4 inches deep, subsoil stiff red clay; previously cropped on eleven occasions with oats, summer fodders and rice, last crop rice in 1928-29. Disc ploughed 4 inches mid-September, disced mid-March, springtoothed end of March and again in April, sown with drill in fair seed bed on the 27th April, using 60 lb. seed and 60 lb. superphosphate per acre. Land was not irrigated prior to sowing, and growing crops received a setback during the dry spell in September. Yields of all varieties were reduced owing to stem rust, and in the case of Nabawa owing to lodging badly. Growing plots were irrigated on the 15th September. Harvested on 22nd December.

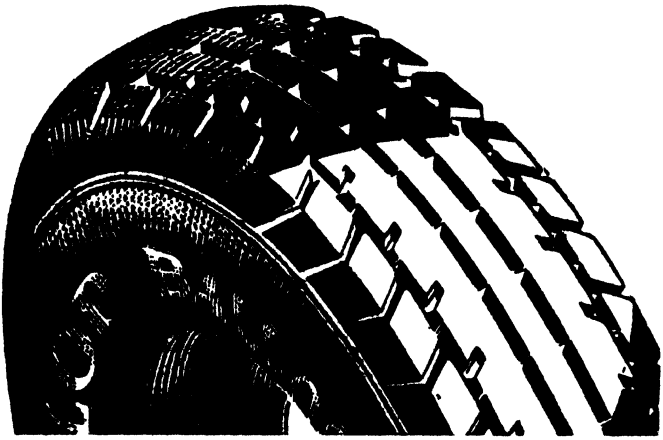
Murrami (W. R. Clark, Farm 1493).—Soil grey clay loam 6 inches deep, subsoil grey clay; previously cropped three times, last crop rice in 1928-29. Mouldboard ploughed 4 inches deep in December, combined early February, irrigated end of February, combined mid-March, harrowed end March and sown with a combine in a moist seed bed on 8th April, using 60 lb. seed and 60 lb. superphosphate per acre. Yields of Cadia and Exquisite were reduced owing to lodging. Stem rust and continuous wet weather during harvesting further greatly reduced yields of Cleveland, Penny, Yandilla King, and Cadia. Plots were irrigated on 14th September. Harvested between 19th December and 16th January.

Calorofield (K. B. R. Harrison, Farm 1132).—Soil red to grey clay loam 5 inches deep, subsoil red and grey clay; previously cropped once only with rice in the 1928-29 season. Disc ploughed 4 inches early in January, irrigated 3rd March, springtoothed 15th March, harrowed 17th April, sown with disc drill in moist seed bed on 24th April, using 60 lb. seed and 60 lb. superphosphate per acre. The plots were fed off early in July. Yields of all varieties were reduced slightly owing to hail and wet harvesting conditions. Yields were also reduced in the case of Yandilla King owing to low patches becoming waterlogged, in Cadia and Exquisite owing to lodging badly, and in Penny owing to stem rust. Plots were irrigated in mid-September. Harvested between 16th December and 11th January.

Leeton (F. King, Farm 385).—Soil red and grey clay loam, 6 inches deep, subsoil stiff red and grey clay; previously cropped on eight occasions, last crop rice in 1928-29. Disc ploughed 4 to 5 inches early in November, springtoothed mid-January, irrigated 1st March, disced 11th March, harrowed 12th March, sown on 6th April with drill 2½ to 3 inches deep with the object of sowing in moisture. Sixty pounds seed and 60 lb. superphosphate per acre were used. Yields of all varieties were reduced owing

YIELDS of Wheat Variety Trials.

Variety.	Irrigable Plots.												Dry Area Plots.							
	Murrami.				Wamoon.				Caloroflield.		South Gogeldrie.		Fivebough.			Brobenah.			Colando.
	Farm 1493.	Farm 1457.	Farm 1081.	Farm 1425.	Farm 367.	Farm 403.	Farm 385.	Farm 383.	Farm 1132.	Farm 1137.	Farm 1697.	Farm 1700.	Farm 56.	Farm 30.	Farm 49.	G. G. St. C. Potts.	T. C. Davies.	E. McKenzie.	Far 1039.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie...	...	...	...	...	...	...	...	...	...	30 40	...	...	5 58	...	...	...	18 50	30 0	...
Bald Early	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13 33	17 5	...	...	...
Barwang	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9 0
Bobin	...	...	...	...	...	...	...	...	...	34 6	...	...	5 42	...	11 51	17 43	22 30	30 56	...
Cadia	16 11	17 10	26 51	...	...	...	23 6	...	21 12	...	...	...	...	...	...	...	...	...	...
Canimbla	39 54	26 5	26 59	...	...	...	24 8	...	40 15	...	...	...	...	...	...	...	...	...	...
Canberra	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16 38	...	...	...
Cleveland	25 5	...	...	23 23	...	22 9	...	...	40 2	...	...	...	...	...	...	...	...	...	...
Clarendon	...	...	...	...	...	...	...	...	...	...	...	...	6 6	...	10 23	...	...	...	...
Currawa	...	27 6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Duchess	...	...	...	...	...	...	...	20 14	...	...	...	...	...	...	...	...	...	...	...
Duri	...	...	...	...	...	...	...	...	...	35 42	...	...	...	...	11 43	15 37	22 37	30 53	...
Exquisite	30 31	14 40	35 48	16 32	...	17 27	17 50	...	29 4	...	...	...	...	...	...	...	...	...	...
Federation	...	...	...	...	31 38	...	...	24 8	...	...	24 4	25 34	...	9 10	...	...	...	...	5 52
Ford	...	...	...	...	28 25	...	...	21 55	...	...	...	...	...	9 35	...	...	...	...	6 5
Free Gallipoli ...	...	...	...	...	33 8	...	...	26 44	...	...	34 2	22 48	...	9 35	...	...	...	...	8 55
Hard Federation ...	...	...	...	...	...	...	...	...	...	35 4	...	...	...	...	6 51	17 43	11 30	...	...
Marshall's No. 3 ...	...	24 32	33 49	14 56	...	19 26	27 18	...	30 56	...	...	...	...	...	...	...	...	...	...
Nabawa	...	...	...	...	26 42	...	...	27 48	...	...	24 57	26 41	...	16 40	...	...	...	...	9 1
Nizam	...	...	...	...	32 19	...	...	...	...	...	...	19 37	...	9 20	...	...	...	...	6 0
Onas	...	...	...	...	...	...	...	26 49	...	...	23 9	...	...	...	...	...	...	...	...
Penny...	20 48	26 34	30 50	23 15	...	24 12	...	19 59	35 43	...	...	22 8	...	...	...	...	...	...	...
Ranee...	...	...	...	...	...	...	...	...	...	26 51	...	...	4 19	...	...	18 9	15 7	30 48	...
Riverina	...	...	...	...	...	...	...	...	...	22 22	...	...	7 55	...	...	...	...	28 45	...
Rajah	...	...	...	...	...	...	...	...	...	...	...	...	5 52	18 5	15 8	17 38	13 10	29 2	...
Turvey	34 26	...	28 20	19 59	...	22 7	20 25	...	...	...	...	...	...	...	...	...	...	...	...
Union...	...	...	...	...	33 6	...	...	19 30	...	...	21 58	21 0	...	8 30	...	...	...	...	8 20
Waratah	...	...	...	...	...	...	...	...	...	31 40	25 16	...	5 32	...	11 57	15 35	16 35	27 55	...
Wandilla	...	...	...	28 39	34 32	20 13	...	...	...	...	34 32	...	...	...	...	...	...	...	...
Yandilla King ...	29 8	22 12	28 35	25 47	...	18 40	25 27	...	30 49	...	...	...	...	...	...	...	...	...	...



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to the plots being allowed to stand too long after ripening and because of stem rust. Yields of Canimbla were reduced by shedding and of Exquisite by foot-rot.

South Gogeldrie (C. W. Pike, Farm 1697).—Soil red loam 6 to 12 inches deep, subsoil red clay; virgin land. Disced 3 to 4 inches mid-August, harrowed after rain mid-September, again end of January, disc cultivated mid-March, irrigated 28th April, springtoothed lightly 25th May and sown with combine in moist seed bed on 7th May, using 60 lb. seed and 60 lb. superphosphate per acre. Waratah, Nabawa, and Onas lodged badly, while Nabawa, Waratah, and Federation shed badly. Yields were further reduced in all plots by stem rust and wet harvesting conditions. All varieties were irrigated late in September.

Parts of the plots were harvested with a header, the remainder with a binder, and threshed between 16th December and 21st January.

Comments on Wheat Varieties.

Among the early-maturing wheats, Bobin has once again outyielded the standard variety Waratah on the dry areas. During the past two years this variety has stood up to the droughty conditions splendidly and is now possibly the most favoured early variety. Rajah, Duri, and Ranee have also continued to display very excellent yielding qualities under the adverse seasons experienced here during the past few years, and are rapidly gaining favour. During the past three or four years conditions have been abnormally dry at periods when wheat and oat crops most required rains to ensure satisfactory yields. A most outstanding feature in connection with early-maturing wheats is that they have been yielding considerably better when sown about the first week in May.

Federation, the standard mid-season wheat, again did well on both irrigable and dry areas, more particularly on new land and soils which were comparatively free from flag smut, while Nabawa, which has become so popular during the past few years throughout the dry areas, as well as on irrigable country, again yielded well, despite the weakness of its straw. During the past few years this weakness has not occurred to any extent under irrigation conditions, but this season it has been bad on both wet and dry areas, and many crops of Nabawa, which farmers were unable to harvest prior to the late November and December rains, lodged badly.

Among the late-maturing wheats, Yandilla King, Cleveland, Penny, Marshall's No. 3 and Wandilla were again outstanding, Yandilla King being by far the most sought after late variety on wet and dry areas for both hay and grain crops. On the irrigable section, where the practice of irrigating wheat lands during February and early March, and subsequently cultivating to obtain a satisfactory seed bed, has become firmly established, late to mid-season wheats are almost essential, and Yandilla King has proved the ideal variety under such conditions.

Oat Grain Variety Trials.

Oat grain variety trials on 2-acre plots were carried out on six farms. Two of these failed owing to drought, and in these cases no records were obtained. At the four remaining centres the plots were irrigated and the yields were as follows:—

YIELDS of Irrigated Oat Variety Trials.

Varieties.	Murrami (Farm 1081).	South Gogeldrie (Farm 1700)	Wamoon (Farm 408).	Calorofield (Farm 1182).
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian	......	... ..	40 20	28 8
Belar	......	31 15	......	23 29
Buddah	21 6	... ..	......	......
Guyra	......	. . .	21 36	24 14
Lachlan	......	.. ...	28 3	30 29
Mulga	43 22	34 6	......	......
Palestine ...	58 32	23 12	......	......
Reid	... .	.. ...	24 13	Nil.
Sunrise	38 10	16 0	......	.... .
White Tartarian...	.... .	Nil.	34 14	.....

Cultural Details of Oat Crops.

Calorofield (K. B. R. Harrison, Farm 1132).—Soil red sandy loam, 6 inches deep, subsoil red clay; old cultivation land, last crop wheat in 1929. Irrigated prior to ploughing with disc plough 4 inches deep in early January, irrigated again mid-February, spring-toothed mid-April, sown with a drill in a moist seed bed on the 1st May using 60 lb. seed and 60 lb. superphosphate per acre. The plots were fed off too heavily during late June, July, and August, and never fully recovered, reduced yields resulting. Reid matured unevenly and most of the grain was lost by shedding. Harvested on 25th November.

South Gogeldrie (S. J. Hinton, Farm 1700).—Soil red clay loam 5 inches deep, subsoil red clay; previously cropped once only (Sudan grass in 1929). Disc ploughed early September, springtoothed full depth early October, irrigated and then sown with Sudan grass; light crop resulted, and was fed off with sheep, then springtoothed full depth 1st March, springtoothed lightly 20th March, sown with combine in fairly moist seed bed on 2nd May, using 60 lb. seed and 60 lb. superphosphate per acre. Yields of Sunrise reduced owing to lodging and shedding badly and of Belar and Mulga owing to lodging slightly. White Tartarian matured very late and was not worth harvesting owing to shedding. Plots harvested on 3rd December, 1930.

Wamoon (Power and Whelan, Farm 403).—Soil red to grey clay loam 6 inches deep, subsoil stiff red and grey clay; cropped four times previously last crop 1928-29 season. Disc ploughed 4 inches in October, disc cultivated in January, again mid-March, irrigated 16th March, disc cultivated end March, sown with drill in good seed bed on 12th April, using 60 lb. seed and 60 lb. superphosphate per acre. The yields of Algerian, Guyra, and

Lachlan were reduced by lodging and shedding. These varieties were harvested on 1st December. Reid and White Tartarian matured late and were harvested on 30th December. The yields of both these varieties were reduced owing to shedding.

Murrami (H. L. Tooth, Farm 1081).—Soil red clay loam 6 inches deep, subsoil grey clay; previously cropped twice with rice in succession, the last occasion being during the 1928-29 season. Disc ploughed 4 inches mid-February, scarified end of February, irrigated 1st April, springtoothed 17th April, sown light drill on 20th May, using 60 lb. seed, and 60 lb superphosphate per acre. The seed bed was in fair condition, but too moist. Yields were reduced in Palestine, Mulga and Sunrise owing to lodging; further loss occurred in Sunrise owing to shedding badly.

Comments on Oat Varieties.

The four oats-for-grain variety trials were carried out on irrigation farms. Palestine again proved itself a particularly heavy-yielding variety, possessing the advantage, as far as a crop for grain is concerned, of only growing to a height of about 3 feet 6 inches under irrigation, in which case there is less likelihood of lodging, while there is also less tendency for the grain to thresh out of the heads during windstorms, particularly during early November.

Algerian, the variety which has proved to be the most suitable for general purposes throughout the Irrigation Areas during recent years, again yielded very well and once more comprised the bulk of the sowings throughout this end of the irrigation area.

Mulga, although still yielding well, appears to be losing favour here owing to its tendency to shed the grain if not harvested immediately after ripening.

Although Buddah has been tried out for some years against other varieties, it has yet to do something worth while recording in this district.

Wheat Trials in the Federal Capital Territory.

JOHN L. GREEN, H.D.A., Agricultural Instructor.

Variety and fertiliser trials with wheat were conducted on farmers' experiment plots in the Federal Capital Territory last season.

The Season.

The season in this generally favoured district was unusual. The rainfall, both in total and incidence, was quite satisfactory, and the weather, except for three days during November, was quite seasonal, and all winter cereal crops made exceptionally heavy growth. The three days, 12th 13th, and 14th November, were comparatively hot, fine and clear, and a strong, drying, westerly wind was blowing, and it was in this short period that prospective twelve-bag crops were reduced to anything from one and a half to seven bags. Those crops in the more exposed positions, represented by the plot at Weetangera in these trials, suffered most. The growth on this plot averaged 5 feet in height, and would have cut about 2 tons of hay per acre, but as a result of this setback the trial was hardly worth harvesting, the yields being very low and the grain barely recognisable as wheat.

The rainfall recorded over the fallow and growing period was as follows:—

September, 1929, 115 points; October, 95; November, 311; December, 407; January, 1930, 31; February, 53; March, 40; April, 174; May, 182; June, 131; July, 188; August, 169; September, 67; October, 417; November, 104; December, 96 points.

The Plots.

Ainslie (E. Schumack).—Soil red granite loam; cropped five years to wheat and oats, last crop oats 1928. Mouldboard ploughed 5 inches deep in September, lay until disced on 25th April, harrowed 28th April. This fallow was not cultivated at all, but grazed with sheep right through. Sown with disc drill on 29th April, wheat 60 lb., superphosphate 84 lb., per acre being used.

Duntroon (E. Tindale).—Soil medium red loam; cropped six years to wheat and oats, last crop oats 1928. Mouldboard ploughed 5 inches deep in August, lay, grazed with sheep, disced and cross-disced in March to clean up paddy melon growth, harrowed. Sown with hoe drill on 6th May, wheat 60 lb., superphosphate 70 lb. per acre being used.

Weetangera (R. W. Shelton).—Soil red loam; cropped thirty years, pasture 1918 until 1928, wheat 1929. Disc ploughed 5 inches deep on 4th March. Sown with combine on 30th April, using 64 lb. wheat and 84 lb. superphosphate per acre.

YIELDS of Wheat Variety Trials.

Variety.	Ainslie. (E Shumack.)		Duntroon. (E. Tindale.)		Weetangera. (R. Shelton.)	
	bus.	lb.	bus.	lb.	bus.	lb.
Nabawa	28	52	30	36	12	44
Turvey	26	48	31	11	8	40
Waratah	26	24	27	32	11	40
Federation	24	8	27	25	8	16
Cleveland	23	44	24	54	7	24
Marshall's No. 3	23	24	27	37	8	40
Cadia	23	12	26	50	10	16
Union	22	56	27	27	8	56
Canberra	20	48	28	21	6	52
Yandilla King	20	24	23	10	6	0

YIELDS of Wheat Manurial Trials.

Fertiliser Per Acre.	Ainslie. (E. Shumack.)	Duntroon. (E. Tindale.)	Weetangera. (R. Shelton.)
	bus. lb.	bus. lb.	bus. lb.
2 cwt. superphosphate ...	32 4	29 53	4 48
1 ,, ,, ...	24 40	29 16	6 16
½ ,, ,, ...	16 40	28 20	5 8
No manure	11 35	24 36	4 50

Diseases.

The Federal Territory is free of flag smut and no evidence of this disease was seen during the past season. Rust infection in some plots was rather bad; Turvey appeared to be most prone to the disease, being more badly infected than any other variety; next to this variety were Union, Marshall's No. 3, Federation, and Yandilla King in that order. Nabawa and Waratah were more free of the disease than any of the varieties. Foot-rot was evident in all varieties, and no one wheat appeared to resist it more than another.

Comments.

The most surprising feature of these trials is the low yield of Yandilla King, which is the most popular variety in this district and a larger area of it is sown than of any other variety. Not only did it fail in these trials, but large areas of 200 to 300 acres were practically failures when compared to adjacent paddocks of other varieties.

Nabawa was included for the first time and gave surprisingly good yields, as also did Turvey, Waratah, and Federation which held their positions of favour. Union yielded best of all varieties in the 1929 season trials, but was well down the lists for this season.

In a season when tall growth was made it was possible to observe the strength of straw of the different varieties, Canberra showed considerable weakness and went down badly; Nabawa was the only other variety to show weakness, and it is in this character of strength of straw that it requires improving.

In the manurial trials the outstanding result was obtained at Ainslie; it was on this same property that last season superphosphate gave an increase of 20 bushels per acre. In all the trials the benefit of superphosphate was evident from the start. The trial at Weetangera can hardly be considered as the yields are low and an outside factor considerably influenced the results.

Cereal Hay Trials on Monaro.

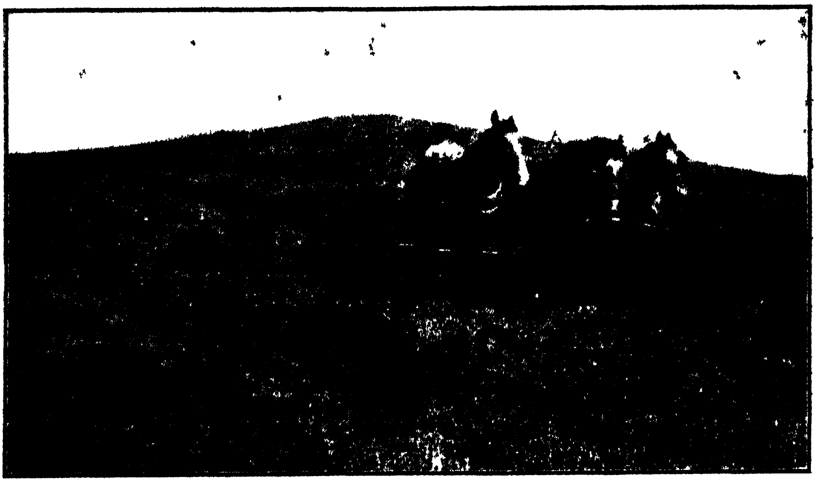
JOHN L. GREEN, H.D.A., Agricultural Instructor.

Trials with varieties of cereals for hay and experiments for the purpose of determining the effect of manures on hay yields were conducted on farmers' experiment plots at a number of centres on Monaro last year.

Seasonal Conditions.

At Delegate and Canberra conditions were very good, both for obtaining a germination in the early part of the season, and in the spring for making heavy growth. Each of these trials was fed off heavily to sheep until the end of August, and as a result the hay growth was not heavy and the yields appear rather light.

In the trial at Berridale the yields are exceedingly light, but this was only to be expected with the exceptionally dry season experienced. Less rain was recorded for 1930 than for many years past; the highest daily total from sowing to harvesting the crop was 90 points, and the rainfall for this period was 892 points spread over thirty-nine recordings.



Harvesting Algerian Oats at Duntroon.

Owing to the heavy nature of the black soil and dry conditions growth was too light in the trial at Ando (H. P. Vaughan) to warrant harvesting.

The following is the rainfall at the various centres:—

RAINFALL Table.

	Delegate.	Ando.	Berridale.	Canberra.
	points.	points.	points.	points.
1930—				
March	119	24	63	40
April	95	44	22	182
May	233	170	190	174
June	457	456	275	136
July	77	111	34	188
August	235	130	53	169
September	89	88	67	66
October	379	286	213	421
November	111	106	38	105

The Plots.

Delegate (T. M. Walcott).—Soil medium to light loam; pasture for last twenty years. Disc ploughed 5 inches deep on 27th September, harrowed 10th January, cultivated 17th January, rolled 14th February, cultivated 6th March. Sown with disc drill on 14th March, using 76 lb. wheat, 80 lb. oats, and 56 lb. superphosphate per acre. Harvested on 12th December.

Berridale (W. Chandler).—Soil rather poor quality hill granite loam; cropped two years only with wheat. Mouldboard ploughed 3 inches deep on 20th March and harrowed once only. Sown with hoe drill on 25th March, using 70 lb. wheat, 72 lb. oats, and 56 lb. superphosphate per acre. Harvested on 17th December.

Canberra (H. S. Gullett).—Soil variable grey loam; cropped for two years with oats. Mouldboard ploughed 4 inches deep on 27th December, lay, fallow grazed, and harrowed once only on 27th March. Sown on 1st May with hoe drill, oats 58 lb. and superphosphate 56 lb. per acre being used.

YIELDS of Cereal Hay Variety Trials.

Variety.	Delegate.			Berridale.			Canberra.		
	t.	cwt.	qr.	t.	cwt.	qr.	t.	cwt.	qr.
Wheat—									
Cleveland	1	4	2	0	15	3	....		
Yandilla King ...	1	0	0	0	8	0	....		
Marshall's No. 3 ...	0	19	0	0	10	1	....		
Cadia	....			0	15	2	....		
Waratah	....			0	8	1	....		
Oats—									
Algerian	1	14	1	0	15	3	2	3	3
White Tartarian ...	1	17	3	....			....		
Guyra	1	11	1	0	16	1	1	10	2
Mulga	1	11	1	0	11	3	1	5	3
Belar	....			0	13	3	1	7	0
Sunrise	....			....			1	5	1
Buddah	....			....			1	4	2

YIELDS of Algerian Oats Manurial Trials.

Fertiliser Per Acre.	Delegate.			Berridale.			Canberra.		
	t.	cwt.	qr.	t.	cwt.	qr.	t.	cwt.	qr.
112 lb. superphosphate ...	2	0	0	0	14	3	....		
56 ,, ,, ...	1	10	2	0	15	3	1	5	3
56 lb. M22	1	5	1	0	13	1	....		
56 lb. basic superphosphate	1	2	2	0	12	3	....		
84 lb. basic slag ...	1	13	1	....			....		
No manure	1	0	3	0	12	1	1	4	3

Remarks.

The popular late-maturing variety Cleveland gave the best yields in each of the wheat variety trials. Cadia, a selection of Cleveland, was little inferior in the only trial in which it was included. It is surprising to see these two varieties yielding so well at Berridale, where, although nearly in the middle of the Monaro, conditions are not typical of it, and certainly much inferior to those obtaining in the Bombala district. Unless required for grain, which is not often the case in this district, the wheat crops would be much better replaced with oats.

Again, in the oat varieties the late maturers were well to the fore in the Berridale and Delegate districts. It is not anticipated that early-maturing varieties will find a place in competition with White Tartarian, Algerian, and Guyra; those farmers who have not tried this latter variety would be well advised to do so, as it is earlier than either White Tartarian or Algerian and has given very satisfactory yields when tried with either of these.

In the trial at Canberra, Algerian, which is the standard variety for the district, outyielded all other varieties rather easily. It was a season to suit this variety, and also Algerian probably was not nearly as much affected by the heavy grazing that was given this plot as were the other varieties. Guyra has given better results elsewhere in the Territory. The early varieties, Mulga, Buddah and Sunrise, all yielded within a few pounds of each other; Mulga is generally considered superior to the others, and should be the choice of the quick-maturers.

In the manurial trials very outstanding results were obtained at Delegate. In this district top-dressing of pastures is the practice, and this trial should confirm the contention that the granite soils of this district need phosphoric acid. The dry season at Berridale and the subsequent light growth was against outstanding results, and consequently very little notice can be taken of the results of this particular trial.

At Canberra heavy rain at sowing time and the fact that the last few plots were sown under difficulties made it impossible to obtain a satisfactory germination. This accounts for the low yields in the manurial trial of Algerian compared with the yield of this variety in the variety trial section.

A NEW BOOKLET ON STRAWBERRY CULTURE.

As a sideline for orchardists there is no crop (provided conditions are favourable) which gives a better return than strawberries. Only a small area is required—a quarter of an acre well cared for is capable of yielding over £60 in one year. The work is light and offers the thrifty wife and younger members of a household an opportunity to add to the family income.

To obtain returns such as mentioned above a good deal of attention is naturaly called for, while the better the grower's knowledge of strawberry varieties, treatment of beds, preparation of the land, method of planting, marketing, etc., the greater will be his or her success. All this information is very readably presented in Farmers' Bulletin, No. 166 (*Strawberry Culture*), now available from the Department of Agriculture, Box 36A, G.P.O., Sydney; price 8d., including postage. The booklet contains twenty-two pages, and is very well illustrated.

Stack Silage on a Tumut Farm.

I. W. SCOTT, Senior Dairy Instructor.

The work done on Gocup Estate last December by Capt. M. Colyer in the utilisation at low cost of the surplus growth of pastures which would otherwise have been wasted, provides an object lesson that should be studied by all stockowners who are in a position to make similar provision to maintain their herds without loss in times of fodder scarcity.—L. T. MacInnes, Director of Dairying.

The dairy-farmer who relies solely on pasture and hay for maintaining the milk and cream supply during the leaner months of the year is running a very definite risk, and the provision of succulent feed in the form of silage is a very wise precaution.

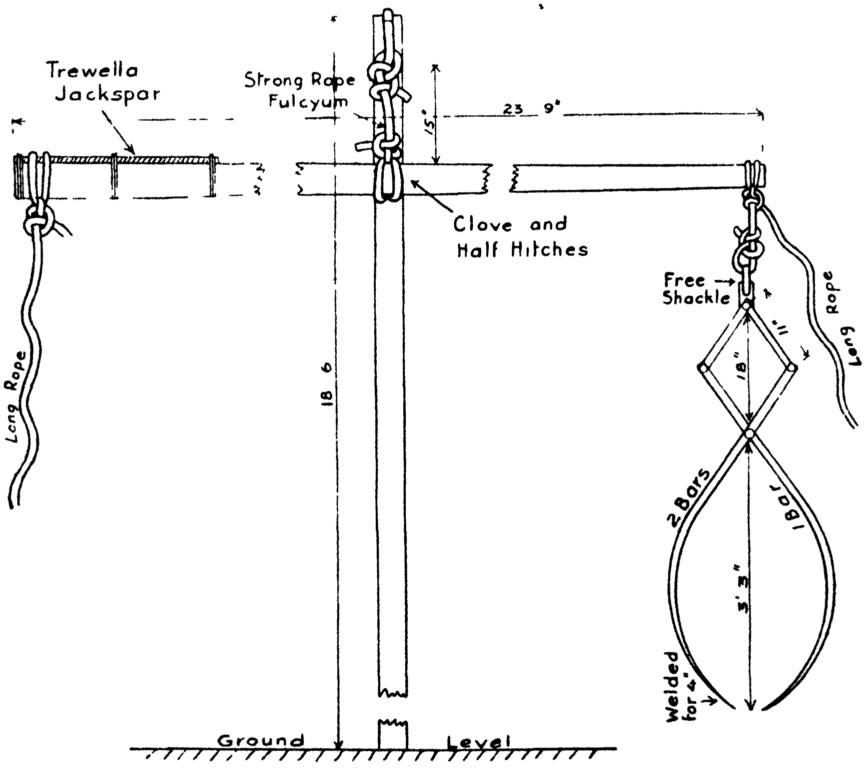


Fig. 1. Diagram of "Shadoof" Whipstick, showing details of Fulcrum and Grab.

Silage can be made in a stack without any considerable expenditure, nor is any preparation, such as the excavation of a pit, necessary. While stack ensilage is not the best method of making silage, it should prove a useful and convenient practice on many New South Wales dairy farms, both coastal and inland, particularly where, with the progress in pasture management, it is realised that during the period of flush growth. pastures should be kept short and succulent by careful grazing and the mowing of all growth unable to be controlled by grazing, thus enabling the excess growth to be conserved as silage.

The abundance of trefoil and grass in the Riverina and Tumut districts during last spring afforded an excellent opportunity for farmers to build up reserves of silage. Unfortunately this was not availed of as it should have been, probably because farmers were uncertain as to the results that would be obtained. Results in New Zealand and elsewhere indicate that good silage can be made from young grass and herbage, and in those countries this operation has now passed the experimental stage.

The following notes on the making of stack silage as carried out last spring on "Gocup," the property of Messrs. Colyer and Colyer, of Tumut, together with particulars of apparatus and costs, were supplied by Capt. M. J. Colyer.

The stack was built on the ground, no straw or other material being placed next to the ground, as it was considered that this might result in air gaining access to the stack. The material ensiled consisted of oats and trefoil, with rye and other grasses; the oats and trefoil had formed seed when cut.

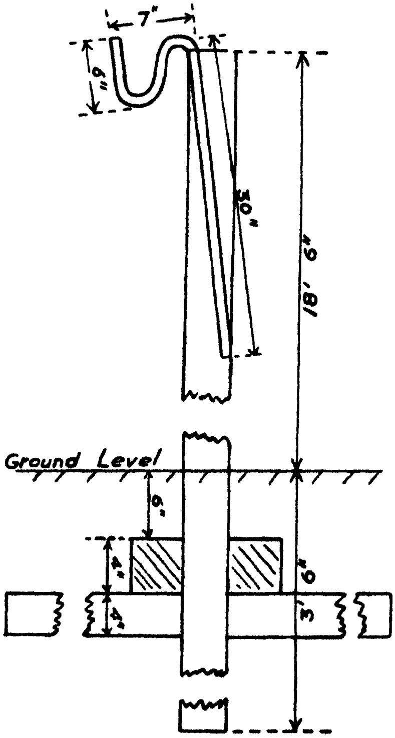


Fig. 2.—Section of Mast showing details of Fulcrum Hook and of "Deadmen."

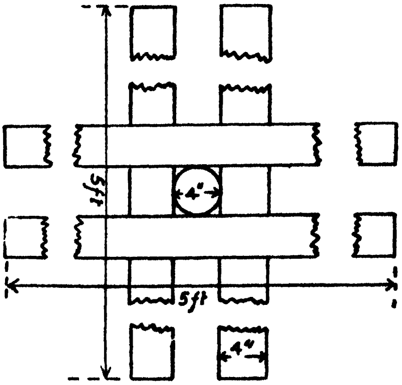


Fig 3.—Plan of Mast to show position of "Deadmen."

For lifting the material on to the stack full use was made of the "Shadoof" hoist, constructed much on the lines adopted by the ancient Egyptians.

The Construction of the "Shadoof."

The upright consisted of 4-inch galvanised irrigation pipe (with one flange), 22 feet long, and with a height above ground of 18 feet 6 inches. There were no stays above ground to hamper working, but the upright mast was supported by four "deadmen" below ground, each 5 feet long and 4 inches square, buried 6 inches and more below the surface.

The fulcrum hook which was dropped loosely into the top of the mast consisted of a rough S hook with a long leg, made of 1-inch round iron. This hook was free to rotate, and carried the rope support to the whipstick on the outer curve of the hook.

The whipstick, made of stringy bark, was 23 feet 9 inches long, 16 inches in circumference at big end and 10 inches at small end. It weighed 96 lb., and the fulcrum was 11 feet 4 inches from big end. A Trewella Jack Spar (42 lb. iron bar) was wired along the shorter and thicker end of the whipstick, commencing right at the big end. With this attachment it required a pull of 40 lb. to drag down the longer end of the whipstick at the extreme end where the grab was attached.

A long rope was attached at each extreme end of the whipstick, by means of which either end of the whipstick was raised or lowered and the whipstick, as a whole, rotated round its fulcrum and the load deposited where required on the stack.

The grab was made of three steel bars each 1¼ inches x ⅜ inch.

Costs, Particulars of the Labour, &c.

The particulars of the labour employed, and the cost of the stack of silage were as follows: —

	£	s.	d.
Cost of cutting green fodder—1 man	3	15	0
Carting and stacking—6 men	25	7	6
Roofing and weighting stack—3 men	3	15	0
Bags for roofing (28)	1	1	0
Wire	0	5	0
Lorries, &c.—proportionate cost for time used	2	15	0
Total	£36	18	6

The stack was 26 feet square and originally 15 feet high, though it settled to 5 feet 6 inches. As the top was capped with 2 feet of dirt, wastage should be confined practically to the sides. The estimated tonnage was 65 tons at a cost of 11s. 4d. per ton. The greatest expense was the cost of loading on to the lorries and carts, and it should be possible to reduce this by improved methods of gathering and by using specially-designed skids and tumblers.

Feeding Silage to Dairy Cattle.

Stock should be started on silage gradually, steadily increasing the amount each day, until they become used to it, when they can be given as much as they can eat without leaving any lying about. Preferably it should be fed at the rate of 3 lb. silage and 1 lb. lucerne to every 100 lb. live weight, concentrates being fed in addition according to milk production.

In the case of bulls, excess feeding of silage tends to develop a "pot belly," and not more than 15 lb. per day should be fed.

Fig. 4.—Building the Stack.

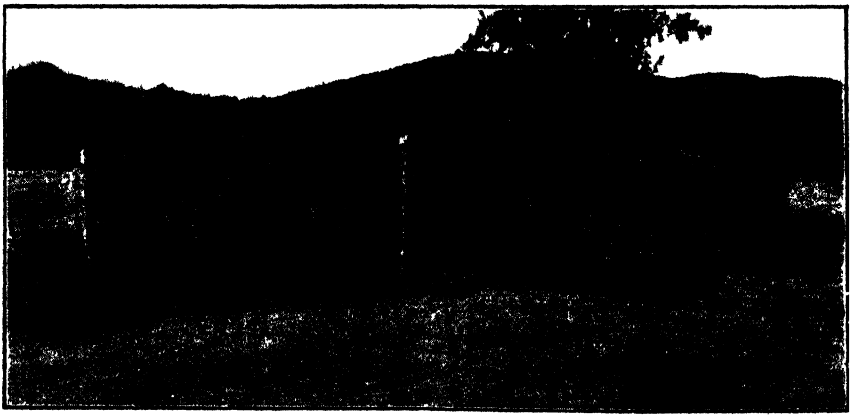


Fig. 5.—The Stack after Settling.
Note the capping of earth; filled bags are placed round the outside to keep the earth in position.

Owing to the present position of the wheat market, wheat could be used in building up a grain ration to supplement silage. In a general way, and for all-purpose feeding, 1 lb. of cracked wheat is equal to 1 lb. of maize. Farmers can substitute wheat, pound for pound, for maize and feed it in the same way and in the same combinations as they have previously used maize. Wheat on its own is not a suitable grain and should be mixed with other feeds to prevent its becoming pasty on mastication. Crushed and fed with bran and other concentrates it is quite a good food.

Suitable grain mixtures that could supplement silage, and in which wheat is used in place of maize are:—

(*a*) Equal parts of wheat, oats and linseed meal.
(*b*) Equal parts of wheat, oats, gluten feed and cottenseed meal.
(*c*) Wheat 300 lb., bran 200 lb., oats 100 lb., linseed meal 50 lb.
(*d*) Crushed wheat rice or maize 200 lb., bran 50 lb., linseed meal, 50 lb.
(*e*) Wheat 200 lb. and linseed meal 100 lb.

In a general way these rations should be fed at the rate of 1 lb. mixture to 3 to 4 lb. milk, according to breed, yield, &c.

INFECTIOUS DISEASES REPORTED IN APRIL.

THE following outbreaks of the more important infectious diseases were reported during the month of April, 1931:—

Anthrax	Nil.
Blackleg	2
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	4
Swine fever	Nil.
Contagious pneumonia	Nil.
Necrotic enteritis	Nil.

—MAX HENRY, Chief Veterinary Surgeon

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with the view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected orange buds to nurserymen during the 1930 budding season, trees from which should be available for planting during the 1931 planting season:—

	Buds of Washington Navel.	Buds of Late Valencia.
T. Adamson, Ermington	3,000	3,000
W. Beck, Epping	1,000	1,000
A. T. Eyles, Rydalmere	3,000	2,000
J. de Freitas, Fairfield	200	200
R. Hughes, Ermington	1,000	1,000
L. P. Rosen and Son, Carlingford	5,000	1,200
B. E. Yarnall, Ourimbah	100	100

—C. G. SAVAGE, Director of Fruit Culture.

Intensive System of Grassland Management in Dairying Districts.

[Continued from page 257.]

J. N. WHITTET, H.D.A., Agrostologist.

IN the first half of this article, which appeared in the April issue of this *Gazette*, the general principles of intensive grassland management were outlined. In this, the concluding instalment, an account is given of trials carried out at Berry Experiment Farm, showing the value of the system as a means of increasing carrying capacity and production, and its effect on the botanical and chemical composition of pasturage.

Rotational Grazing Trial at Berry Experiment Farm.

At Berry Experiment Farm the Manager, Mr. P. Waller, in co-operation with the Agrostologist's Branch, has been conducting an eleven-paddock trial on paspalum (*Paspalum dilatatum*)-White clover (*Trifolium repens*) pastures. Since the commencement of the test, a gradual improvement in the composition of the sward has taken place, especially in the thickening-up of Perennial Rye grass (*Lolium perenne*) in all paddocks which are intensely grazed, and particularly in those receiving nitrogen.

Details of the paddocks, their treatment, yields, &c., are recorded in the following table :—

TABLE I.—Details of Treatments and Results.

Paddock No.	Area.	Previous treatment	Manurial treatment in 1929	Cows carried (milkers and followers) per acre in—				Total grass hay harvested	Butter-fat production per acre.
				163 days.	236 days.	297 days.	365 days.		
	acres							tons.	lb.
3A	9	Nil.	½ ton lime applied in May, 2 cwt. superphosphate in June, 1 cwt. sulphate of ammonia in July	1·07	1·00	·86	·74	4½	193·53
3B	6	Nil.	Same as 3A .	1·25	1·19	1·05	·99	2	219·48
3C	7	Nil.	½ ton lime applied in May, 2 cwt. superphosphate in June, 1 cwt nitro chalk in July.	1·19	1·15	1·02	·86	...	215·59
11A	10	Nil.	Same as 3C	·68	·58	·50	·45	...	116·22
11B	8	Nil.	Same as 3B	·96	·77	·71	·68	...	163·65
12A	7	Two-thirds of paddock ploughed in 1928 and allowed to revert to pasture.	Same as 3C	1·42	1·13	1·03	·99	3	218·75
12B	7	Half of paddock ploughed in 1928 and allowed to revert to pasture.	Same as 3B...	1·60	1·28	1·08	·97	3	212·82
13A	7	Whole of paddock ploughed in 1928 and allowed to revert to pasture.	2 cwt. superphosphate in June.	·89	·81	·70	·65	3	92·50
13B	8	Same as 13A	No manure. Short feed maintained.	·72	·71	·56	·46	3	118·25
14A	8	Nil.	2 cwt. superphosphate in June.	·58	·40	·39	·41	2	112·58
14B	7	Nil.	No manure. Feed allowed to become fairly mature.	·42	·38	·30	·24	...	24·78

[illegible] tions per acre in 1930:—1 cwt. superphosphate in April to paddocks Nos. 11A, 12B, and 13A; 1 cwt. superphosphate in April and 1 cwt. sulphate of ammonia in July to Nos. 3B, 11B, and 14A; 1 cwt. superphosphate in April and 150 lb. nitro. chalk in July to Nos. 3C and 12A; no fertiliser was applied to Nos. 3A, 13B, and 14B.

ESTABLISHMENT *of* PASTURES

The young plants during root establishment cannot forage to any extent for plant food. It is therefore essential when seeding a pasture to use a balanced mixture of readily available fertiliser. When the clovers become established, they are able to fix their own nitrogen and require phosphate applications only. The grasses, however, become nitrogen starved during the cold months and show little growth unless supplied with this plant food. Consequently, for the production of a good "soil cover," the exclusion of weeds, and a balance between grasses and clovers, newly sown pastures should be fertilised as follows:—

A—IN AUTUMN AT SEEDING—
2 to 3 cwts super per acre.
1 to 2 cwts. sulphate of ammonia per acre.

B—IN JULY—
1 to 1½ cwts. sulphate of ammonia per acre.

Applications of nitrogen will, in addition, provide valuable Winter and early Spring feed

For further particulars apply

ADVISORY OFFICER,
NITROGEN FERTILISERS PTY. LTD.
360 COLLINS STREET, MELBOURNE, C.1.

M.I.B. FOODS FOR ALL CLASSES OF LIVE STOCK

For Poultry	Throughout Australia **M.I.B. FOODS** have become famous for their egg producing capacity and their virtue in securing quick and sturdy growth in Young Stock.
For Pigs	**M.I.B. FOODS** will prevent cannibalism in Breeding Sows and speed up the maturity in Bacon and Porker Pigs.
For Calves	The addition of MEAT CONCENTRATES with Skimmed Milk and the like is as good or better than whole milk for rearing Calves.
For Dairy Cows	**M.I.B. BONE PRODUCTS** are rich in calcium phosphates. They aid the milk flow, prolong the lactation period and prevent deficiency diseases.

Write for further particulars to:—

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STATE ABATTOIR, HOMEBUSH BAY
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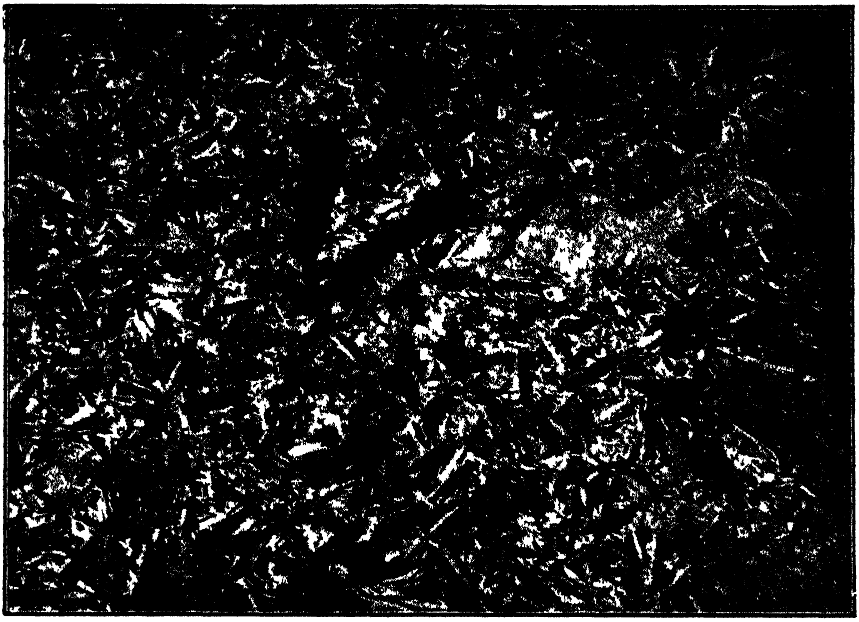
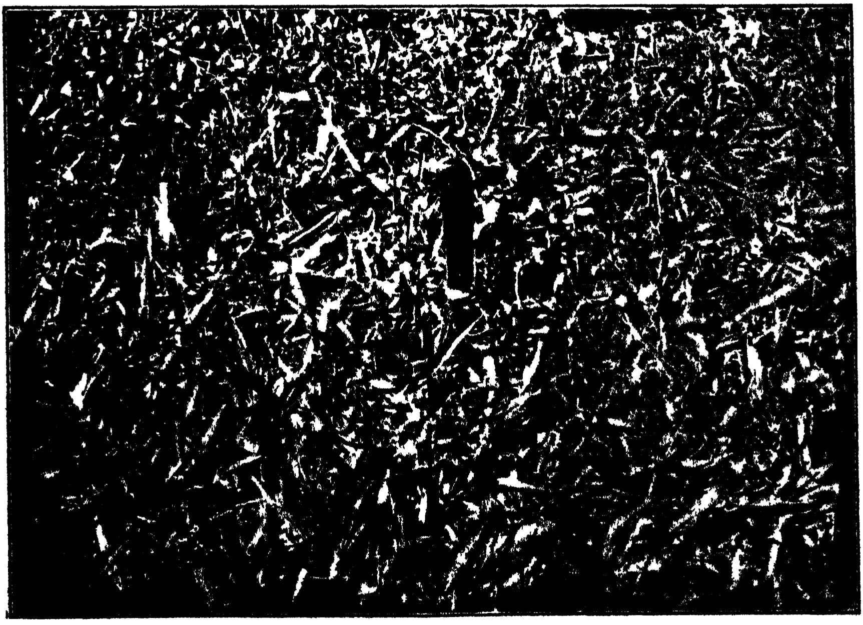


Typical of Paddock 11B (Berry Experiment Farm) Prior to Treatment.



Showing the Results of Intensive Management.

This shows how Perennial Rye grass and White Clover had thickened up in Paddock 11B when photographed in September, 1930.

Prior to applying the fertiliser, all paddocks were heavily grazed, mowed where necessary to eliminate coarse growth, and all dead trash raked up and removed. Heavy pasture harrows were used to tear the paspalum sod in all paddocks, excepting 14B, and manurial treatments as shown in Table I were carried out. After each grazing period was completed a light pasture harrow was used to break up and distribute animal droppings, again excepting paddock 14B.

Two control paddocks were included in the test, viz., 13B, where the feed was kept short and similar workings with pasture harrows given as for the treated paddocks, and 14B, in which case no harrowing was done and the feed allowed to become fairly mature before being fed, as is often the pasture condition that exists on many of the coastal dairy farms of this State.

Paddocks Nos. 11A and 11B are of poorer quality than the other areas in the test, but the response to treatment was very marked.

The beneficial effect of the presence of Perennial Rye grass in the paddocks is shown in the extra carrying capacity of paddocks 3B over 3A and 3C; the last mentioned paddock contains more White clover than 3A, but less Perennial Rye grass than 3B. This grass is also more plentiful in 11B than 11A.

As has always been the case in our paspalum renovation tests, the residual effect of ploughing in paddocks 12A to 13B, inclusive, again indicates the value of this form of renovation. This is very marked when comparing the carrying capacity of the two superphosphate paddocks 13A and 14A, the carrying capacity of the former being 58·5 per cent. heavier than the latter.

The paddocks recording the highest yields of butter-fat per acre indicate where the best feed was produced. Owing to the large area under test, however, it was necessary to use, at certain periods, large numbers of dry stock as followers to control the growth, and therefore the section recording cow-days per acre is a more exact indicator of the value of the treatment given than is the butter-fat figure.

The fallacy of the argument in favour of allowing pasturage to become fairly mature and uncontrolled is shown in 14B. Each time the milking cows were placed in this paddock they dropped in their yield and had to be removed. After three or four visits to this paddock they invariably refused to feed on the growth present and had to be placed on other pasturage.

Table II records the number of cow-days per acre for each month of the test.

A Close-up View of Paddock 14B, showing the Coarse, Unpalatable Growth of Paspalum.

A Section of Paddock 14A, photographed in September, 1930.
This paddock has responded well to the July application of nitrogen.

TABLE II—No. of Cow-days per acre per month.

Month.	Paddocks.										
	3A.	3B	3C.	11A.	11B.	12A	12B.	13A	13B	14A.	14B.
1929.											
October (8th–31st) ...	38·4	..	...	20·0	45·0	37·1	35·9	27·6	..	18·8	...
November . ..	29·4	54·3	64·0	8·8	36·8	15·1	49·0	32·6	13·3	25·4	16·3
December	31·1	51·0	16·3	33·9	29·0	64·1	51·9	27·0	27·5	...	11·6
1930.											
January	38·0	57·3	41·4	28·8	21·8	20·0	32·0	21·9	35·8	10·5	.
February	25·8	35·3	49·1	5·8	14·5	55·0	55·0	24·4	40·1	39·5	
March	31·8	23·7	67·3	14·8	7·5	37·7	30·7	39·7	41·5		40·6
April	24·6	42·5	13·4	7·6	18·3	14·2	28·0	10·0	.	...	20·1
May	10·4	15·7	20·1	16·4	8·8	23·9	17·4	6·7	8·8	..	.
June	9·3	7·0	12·0	4·9	3·0	15·0	...	3·4		18·4	.
July	21·3	26·8	19·0	6·9	26·5	24·6	16·4	14·3	.	6·3	
August	..	20·0		.	20·0	22·9	17·1	5·7		5·0	.
September	10·2	31·3	12·6	16·4	16·1	32·9	3·3	19·1	2·5	10·0	.
October (1st–7th) ...	...	.	.			.	19·7	6·6	...	17·3	...

Whereas the untreated paddocks provided no grazing for a number of months, the treated areas, and particularly those receiving nitrogen, showed to advantage by producing feed practically every month.

Analyses of Pasturage.

Considerable attention has been given of recent years in the older countries of the world to investigating the food value of pasturage at various stages of growth, and the results of chemical analyses have definitely shown that young mixed pasturage is an ideal feed for dairy cows in high production. Analyses of pasturage cut at Berry Experiment Farm in the young or immature stage, compared with adjacent sections of the quadrats where the material was allowed to reach maturity, show a considerable increase in food valu in favour of the former. The young pasturage was cut when 4 inches high and the mature pasturage when the grasses were flowering.

In the treated paddocks the pasturage analysed was a mixture of paspalum (*Paspalum dilatatum*), Perennial Rye grass (*Lolium perenne*) and White clover (*Trifolium repens*). In the unmanured areas 13B and 14B paspalum was dominant in the sward, with small quantities of Perennial Rye grass and White clover appearing after periods of good rainfall.

TABLE III.—Analyses of Immature and Mature Pasturage—Berry Experiment Farm.

Paddock No.	Mature Pasturage before treatment.				Fertiliser Applied.	Immature Pasturage.				Mature Pasturage.			
	Date cut.	Protein (N.x. 6·25).	Lime (CaO).	Phosphoric acid (P_2O_5).		Date cut.	Protein (N.x. 6·25).	Lime (CaO).	Phosphoric acid (P_2O_5)	Date cut.	Protein (N.x. 6·25).	Lime (CaO).	Phosphoric acid (P_2O_5).
		per cent.	per cent.	per cent			per cent.	per cent	per cent		per cent.	per cent.	per cent.
3B	30–5–29	8·88	0·35	0·56	Lime, superphosphate, and sulphate of ammonia.	20–9–29	13·330	0·56	0·59	5–11–29	10·020	0·45	0·60
						18–10–29	15·780	0·52	0·70	22–1–30	8·820	0·40	0·41
						18–11–29	13·360	0·51	0·70				
						19–12–29	10·890	0·54	0·55				
						10–1–30	10·890	0·55	0·49				
						22–2–30	9·660	0·48	0·45				
						Average	12·318	0·526	0·580	Average	9·420	0·425	0·505
11A	30–5–29	6·72	0·24	0·32	Lime, superphosphate, and nitro-chalk.	20–9–29	12·220	0·66	0·44	5–11–29	10·220	0·34	0·51
						18–10–29	16·220	0·59	0·61	22–1–30	8·340	0·34	0·30
						18–11–29	12·440	0·49	0·53				
						19–12–29	9·560	0·50	0·35				
						10–1–30	9·640	0·49	0·34				
						22–2–30	9·280	0·38	0·31				
						Average	11·560	0·518	0·430	Average	9·280	0·340	0·405
13A	30–5–29	7·81	0·32	0·41	Superphosphate	18–10–29	14·450	0·44	0·70	5–11–29	9·560	0·33	0·62
						18–11–29	11·280	0·40	0·64	22–1–30	6·830	0·27	0·42
						19–12–29	8·860	0·37	0·48				
						10–1–30	9·110	0·38	0·44				
						22–2–30	8·650	0·29	0·46				
						Average	10·470	0·376	0·544	Average	8·195	0·300	0·520
13B	30–5–29	8·68	0·25	0·42	No treatment	18–10–29	12·000	0·29	0·54	5–11–29	7·330	0·29	0·53
						18–11–29	9·070	0·30	0·48	22–1–30	5·460	0·20	0·36
						19–12–29	7·560	0·26	0·40				
						10–1–30	7·720	0·24	0·37				
						22–2–30	6·860	0·24	0·38				
						Average	8·642	0·266	0·434	Average	6·395	0·245	0·445
14B	30–5–29	5·64	0·29	0·27	No treatment	18–10–29	11·800	0·56	0·41	5–11–29	8·130	0·46	0·39
						18–11–29	9·900	0·51	0·40	22–1–30	5·730	0·29	0·32
						19–12–29	8·620	0·44	0·35				
						10–1–30	8·800	0·39	0·37				
						22–2–30	7·950	0·37	0·38				
						Average	9·414	0·454	0·382	Average	6·930	0·375	0·355

It will be seen that the treatment for 3B gave an increase of 30·8 per cent. protein, 23·8 per cent. lime and 14·8 per cent, phosphoric acid in the immature feed as compared with the mature growth.

The average composition of immature and mature cuts is shown in Table IV, together with the percentage increase of protein, lime and phosphoric acid.

TABLE IV.—Average composition of all cuts in Table III.

——	Immature pasturage.	Mature pasturage	Increase.
	per cent	per cent.	per cent.
Protein	10·481	8·044	30·3
Lime (CaO)	0·428	0·337	27·0
Phosphoric Acid (P_2O_5) ...	0·474	0·446	6·3

The Effect of Liming.

Although there were no very marked differences in the growth of pasturage on the limed sections of the paddocks, excepting in 11B, it was noted early in the test that the cattle invariably concentrated on the limed area before grazing the remainder of the paddock. It was then decided to obtain samples for analyses from adjacent quadrants in both paddocks 3B and 11A, the results of which are recorded in Table V.

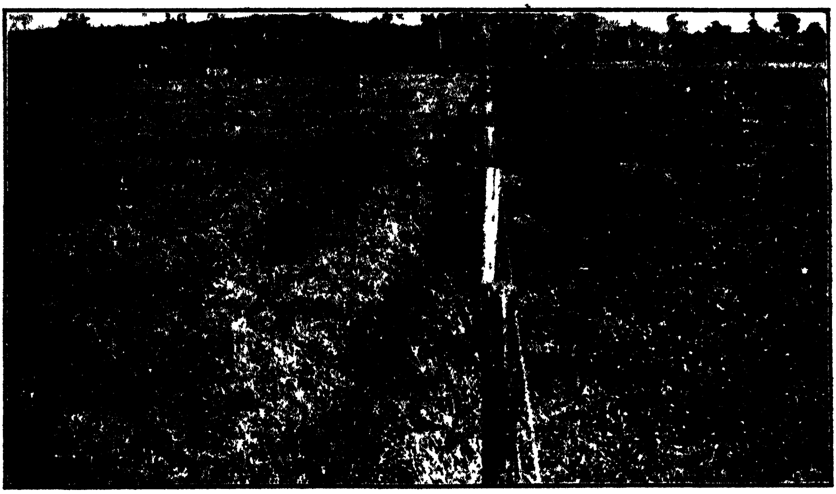
TABLE V.—Effect of Lime on the Chemical Composition of Pasturage.

Paddock No	Immature Pasturage.				Mature Pasturage.			
	Date cut.	Protein (N x. 6·25)	Lime (CaO.)	Phosphoric Acid (P_2O_5)	Date cut.	Protein (N x. 6·25)	Lime (CaO).	Phosphoric Acid (P_2O_5)
		per cent.	per cent	per cent		per cent	per cent	per cent.
				Lime.				
3B	18–11–29	13·360	0·51	0·70	22–1–30	8·82	0·40	0·41
	19–12–29	10·890	0·54	0·55				
	10–1–30	10·890	0·55	0·49				
	22–2–30	9·660	0·48	0·45				
	Average	11·200	0·520	0·547				
				No Lime.				
	18–11–29	11·040	0·39	0·59	22–1–30	8·26	0·36	0·37
	19–12–29	9·330	0·40	0·47				
	10–1–30	9·330	0·46	0·43				
	22–2–30	9·220	0·43	0·41				
	Average	9·730	0·420	0·475				
				Lime				
11A	18–11–29	12·440	0·49	0·53	22–1–30	8·34	0·34	0·30
	19–12–29	9·560	0·50	0·35				
	10–1–30	9·640	0·49	0·34				
	22–2–30	9·280	0·38	0·31				
	Average	10·230	0·465	0·382				
				No Lime.				
	18–11–29	10·680	0·38	0·49	22–1–30	7·70	0·29	0·27
	19–12–29	8·440	0·38	0·33				
	10–1–30	8·620	0·38	0·30				
	22–2–30	8·120	0·30	0·28				
	Average	8·965	0·360	0·350				

Table VI shows the average composition of immature and mature pasturage on limed and unlimed areas. The percentage increase is also expressed, showing the beneficial effect of lime, particularly on immature pasturage.

TABLE VI.—Average of all cuts in Table V.

	Immature pasturage			Mature pasturage.		
	Lime.	No Lime.	Increase.	Lime.	No Lime.	Increase.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Protein	10·715	. 9·347	14·6	8·580	7·980	7·5
Lime (CaO)	0·492	0·390	26·2	0·370	0·325	13 8
Phosphoric Acid (P_2O_5) ...	0·464	0·412	12·6	0·355	0·320	10·9



Left: Paddock 14B. Right: Paddock 14A.

Note the good mixture of grasses and clover in Paddock 14A due to improved pasture management. This area was ready to graze when photographed.

Immature pasturage produced on areas receiving fertiliser and lime showed an increase of 34·3 per cent. protein, 51·4 per cent. lime and 45·0 per cent. phosphoric acid over mature feed receiving fertiliser but no lime.

Rainfall.

The average annual rainfall at Berry for twenty-seven years is 56·21 inches, while the monthly records for the period under review were as follows:—October, 1929 (8th to 31st) 874 points, November 540, December 236, January, 1930, 212, February 128, March 607, April 427, May 443, June 1,611, July 185, August 117, September 30, October (1st to 7th) 15; total 54·25 inches.

It will be seen that the total precipitation for the twelve months was not only slightly below the average, but the phenomenal fall in June resulted in a flooding of the paddocks for a few days and consequently interfered with the normal stocking of these areas. During the years 1929 and 1930 there were only eighty-six and ninty-eight wet days respectively.

Summary.

(1) Under the intensive system of grassland management it is necessary to subdivide efficiently, have the paddocks in good condition and the growth controlled before maximum benefits can be expected from fertilisers.

(2) The length and stage of maturity of the pasturage indicate the optimum time of grazing rather than the quantity of feed in the paddock.

(3) The effect of this system is largely to overcome selective grazing by stock, which invariable happens in areas where growth is not controlled.

(4) All surplus pasturage should be converted into grass silage or grass hay and held as a reserve for dry periods and winter months.

(5) At Berry the composition of the sward has been definitely improved by adopting this system of grassland management, the response of Perennial Rye grass and White clover being very marked, particularly during winter months.

(6) The effect of an application of nitrogen is to encourage production in the "off" seasons, provide winter feed and encourage extra growth when untreated areas are unproductive. This is shown in Table II in the case of paddocks receiving applications of nitrogen in 1930.

(7) Tables I and III indicate (1) that the food value, milk-producing qualities and carrying capacity of immature pasturage are superior to mature pasturage, and (2) that a definite increase in the nutritive values of the pasturage has resulted from the use of fertilisers.

(8) Table V shows a definite improvement in the quality resulting from the use of lime; the soils in both those paddocks are deficient in this ingredient.

(9) Rainfall has a definite influence on the quality of the pasturage produced, the protein content of feed being considerable reduced during dry periods.

(*Concluded.*)

FERTILISER TRIAL WITH ONIONS AT BATHURST.

A FERTILISER trial with Early Barletta onions was conducted at Bathurst Experiment Farm last season, being sown on 7th February, 1930, transplanted on 15th May, and the fertiliser chipped in on 23rd May.

The results of this and the previous season's trials indicate that even on the rich alluvial loams of the district in normal seasons, the application of a mixture of equal parts of superphosphate and bonedust to the onion crop at the rate of 3 cwt. per acre is the most profitable.

Stem Rust of Wheat.

OBSERVATIONS AT GLEN INNES DURING THE 1930–31 SEASON.

S. L. MACINDOE, B.Sc.Agr., Assistant Plant Breeder.

THE stem rust epidemic experienced over a considerable portion of the wheat belt of New South Wales during the past season has again called attention to the need for the production of varieties which combine high yield with immunity or a very high degree of resistance to rust. While at the present time no variety exists in New South Wales which combines these qualities in the highest degree, some well-known varieties show a much higher degree of resistance to stem rust than others, and these must be recommended for the present for those districts, such as the tablelands and the North-western Slopes, which are most liable to rust damage.

A very severe infection in the plant breeding plots at the New England Experiment Farm, Glen Innes, during the past season afforded an excellent opportunity to observe the resistance of well-known varieties to stem rust under such conditions. In such a severe epidemic the differences between resistant and susceptible varieties are very marked, and the observations are much more significant than in seasons or districts of milder infection. The outbreak also made it possible to indicate those varieties which possess a very high degree of resistance or immunity to rust, and which are therefore of value as parents in producing wheats which combine this resistance with high yield. Some progress has also been made in selecting such types from previous crosses.

The rust epidemic of the past season was due in part to a fairly heavy rainfall during the critical month of October. The abnormally mild winter conditions, which caused exceptionally vigorous and luxuriant growth during the earlier part of the season, also rendered the wheat plants more susceptible to the attack of the fungus.

In New South Wales the black stem rust (*Puccinia graminis tritici*) is of much greater economic importance than the orange leaf rust (*Puccinia triticina*), which is usually only of significance on the coast and to a lesser extent on the cooler tableland districts and parts of the North-western Slopes. Stem rust, which occurs on the leaves as well as all the other above-ground parts of the wheat plant, is doubtless frequently confused with leaf rust. It is important that the differences between the two rusts should be recognised, since a variety may be resistant to one and susceptible to the other. The brownish stem rust occurs in elongated pustules which run together and throw up the epidermis on either side, while the orange leaf rust occurs in small, rounded, isolated pustules which do not generally fuse to form an elongated lesion. The orange-yellow or lighter brown pustules of the leaf rust and the reddish-brown pustules of the stem rust mostly occur during early and late spring respectively, and are replaced later in the season by dark or black pustules. The change in colour is due to a difference in the spores or "seeds" of the fungus which, during the final stages of the growth of the wheat plant, produce the black resting spores which the fungus requires, in some parts of the world at least, to carry it over to the following season. In the case of the stem rust the dark pustules noticeably burst the epidermis, while the black pustules of the leaf rust do not so apparently break the epidermis, but form dull, black spots, largely on the under-surface of the leaf.

The reasons for the resistance to rust of some varieties as compared with others are complex. It is known, however, that many varieties when grown under field conditions may escape rust through earliness of maturity without having an inherent degree of either morphological or physiological resistance. Moreover, fertilisers may often affect the severity of a rust attack. Thus superphosphate, by hastening maturity, may assist a variety to escape rust.

Breeding for Rust Resistance.

Farrer in New South Wales recognised the possibility of crossing rust-resistant with rust-susceptible varieties with a view to combining the resistance of one parent with the desirable agronomic characters and the yield of the other. Biffen at Cambridge proved resistance to yellow rust to be a Mendelian character, so that the results of a cross between a resistant and a susceptible variety might be predicted. Stakman in America found that stem rust was sometimes composed of several different rusts which could be separated on the basis of their power to infect differently various varieties of wheat in the seedling stage. He thus arbitrarily divided rust into different "physiological" forms, and demonstrated that resistance to each could be transferred in a Mendelian fashion according to definite rules. Dr. Waterhouse, of Sydney University, has similarly identified the rust forms which occur in Australia as determined by the seedling reactions of varieties in the glass-house.

These discoveries gave an immediate impetus to the work of breeding commercial wheats resistant to rust. It is essential that the determination of the physiologic forms of rust present should be undertaken in the green-house, for the choice of parents which will give resistance to complementary forms or groups of forms, and ideally also, the testing of families of a cross, should be done under the controlled conditions of the laboratory. Recent workers, however, have shown that there is a difference in the behaviour of some varieties to rust at various stages of growth. Thus wheats which are quite susceptible to rust in the seedling stage in the green-house have been shown to be resistant at heading in the field, though it is also true that varieties which are highly resistant to a particular form in the seedling stage are resistant to it throughout all stages of growth. It must be recognised, however, that under Australian conditions wheat is usually subject to damage from rust only between the heading stage and maturity, and that a variety which is resistant during this period of growth is, for all practical purposes, as useful as a totally resistant variety. Moreover, Goulden, of Canada, and others have shown that this mature plant resistance may be inherited independently of seedling resistance, and that this field resistance to numerous physiologic forms is frequently transferred in a very simple manner as a unit character. This method of breeding for mature plant resistance therefore presents opportunities for the possible development of wheats showing a comprehensive resistance to all new rust forms which may arise, while seedling resistance is frequently limited to certain forms, and may break down through the appearance of new physiologic forms which may arise through mutation or through hybridisation on the barberry plant.

The uncertainty of securing good rust infection in the field is reduced to a minimum by breeding for rust resistance under conditions of high summer rainfall such as occur on the Northern Tableland and on the North-western Slopes, where farmers are co-operating in the work of breeding rust-resistant wheats. In order further to assist the work of breeding and selection, special rust nursery methods are also adopted at New England Experiment Farm, Glen Innes, to secure the maximum rust infection possible in the field.

The tables recording the rust reaction of varieties at Glen Innes during the 1930-31 season show that no New South Wales wheats of high productivity, such as Federation, Canberra, Waratah, Yandilla King, etc., possess any marked degree of resistance to rust, most of them being extremely susceptible. Wheats which show immunity or high resistance to rust are largely emmer or durum wheats, which are unsuitable for direct culture or for the manufacture of flour of good quality for bread making. It was previously thought that the resistance of wheats of these species was "linked" to the undesirable durum or emmer grain characters. The recent evolution of Marquillo, a highly rust-resistant bread wheat, developed at Minnesota Experiment Station from a cross between Marquis, a bread wheat, and Iumillo, a durum, and of the two varieties Hope and H-44-24, produced by Mr. E. S. McFadden, of South Dakota, from a cross between an emmer wheat and Marquis, were hailed as accomplishments of epoch-making importance.

None of these wheats, however, possesses sufficiently high yielding ability under Australian conditions to warrant their direct use, but they are of much value as rust-resistant parents in crossing.

At the Dominion Rust Research Laboratory, Winnipeg, Canada, the rust-resistant durum variety Pentad has been crossed with Marquis, and a number of highly resistant strains of bread wheat have been evolved. At the same station in 1925 the rust-resistant bread wheat H-44-24, itself a cross between Marquis and Yaroslav emmer, was crossed with Marquis. Some of the strains selected from this cross now show great promise in Canada.

Through the courtesy of the American and Canadian workers, these varieties and strains of highly rust-resistant bread wheats have been introduced into New South Wales. Observations during the severe rust epidemic of last season at Glen Innes showed that these wheats were highly resistant or immune. They are rather too late maturing to be of direct value, and are being crossed with early Australian varieties. Furthermore, crosses between Hope and Marquillo and standard high-yielding Australian varieties which have been previously made have been grown in the second generation, and some promising agronomic types have been selected which are practically immune to rust.

It is reasonable to expect that this mature plant resistance, if transferred, will be permanent, as in the Hope and II 44-24 parents, which, while showing susceptibility to a number of forms in the seedling stage, are practically immune to stem rust in the mature plant stage in the field Some progress has also been made with crosses in which Webster, Ford, and wheats from Kenya Colony have been used as rust-resistant parents. Crosses have also been made between common bread wheats and the highly resistant durums, such as Acme, in the hope of introducing the resistance of the durum into the bread wheat. The greatest hope for rapidly securing rust-resistant wheats for the New South Wales farmer lies, however, in using as parents the common or bread wheats into which the resistance of the durum or emmer wheats has been introduced by the American workers.

Glen Innes Observations.

Accurate observations on the rust reaction of varieties are essential in initiating a programme of breeding for rust resistance. The lists presented below represent the reaction of varieties during a year of very severe rust infectation, but they are in general agreement with observations made during previous years at Glen Innes and at other experiment farms. In determining the susceptibility of a variety, not only the number of pustules but also the type of pustule produced must be taken into account. Thus Webster may be covered by very numerous pustules, but the small type of pustule indicates a high degree of resistance.

The relative degree of infection of varieties may be influenced by numerous environmental factors, such as position in the field, the nature of the soil, maturity and stage of development during the period favourable for infection. Some varieties also appear to have the ability to resist the rust attack till the grain has been filled, while other varieties appear to possess a degree of tolerance to the fungus. A variety which shows a degree of resistance may have its resistance partly broken down through abnormal conditions of growth such as may be brought about by foot-rot infection. In such cases pinching of the grain may be due partly to the presence of the foot-rot fungus.

Dry conditions following on rust infection increase rust damage, as rusted wheat hays off rapidly, setting very inferior grain, while adjacent resistant varieties remain green and may set good grain in spite of the dry conditions.

Dr. W. L. Waterhouse has shown that some varieties, including Ford, Lawson, and Warren, have a degree of stem rust resistance to physiologic form 34 in the seedling stage, but that under summer conditions in the glass-house these varieties are completely susceptible to this form. In the field the mature plants of these varieties also possess a fairly high resistance under conditions of moderate infection, while under conditions of high temperature and moisture and of prolific vegetative growth they may become heavily infected and set very pinched grain. Thus while most crops of Ford set plump grain during the past rust year, several badly pinched samples of this variety were handled. In general, however, Ford is more resistant to stem rust than many other varieties.

On account of insufficient field trials, Ford is not yet included in the official list of varieties recommended by the field staff of the Department. It is, nevertheless, already grown to some extent in the north-west, and is likely to increase rapidly its acreage there on account of its comparatively high resistance to stem rust.

Changes in the physiologic forms of stem rust present may also account for differences in the susceptibility of varieties in different years. Dr. W. L. Waterhouse has shown, however, that during the past three years form 34 alone has been found in Australia in material examined by him.

The ultimate damage done by stem rust of wheat is largely determined by its effect on the quality of the grain produced. Generally speaking, there is a relation between the amount or severity of the rust present and grain quality, but there also appears to be a tolerance to rust exhibited by some wheats, as when all other conditions are practically equal some apparently susceptible wheats produce a more satisfactory grain sample than others. Observations in this respect have also been made and are being continued.

Reaction of Varieties to Stem Rust at Glen Innes, 1930.

In the following classification the plumpness or quality of the grain harvested is represented by the decimal figure (0) to (1.0) in brackets after the name of the variety; varieties with a grain sample of (0) to (.6) are below f.a.q. standard. The C number indicates the registered selection of the variety or strain of the crossbred wheat, while (d) indicates durum wheat, and (e) emmer wheat.

RUST FREE (Scale 0).

Abou Fashi (d), (1·0); **Acme** (d), (1·0); **Africano** (d), (1·0); **Aziziah** (d), (1·0).

Beladi 141 (d), (1·0); **Beladi 85** (d), (0·9); **Beladi 26** (d), (1·0); **Beladi 114** (d), (1·0); **Beladi 31** (d), (1·0); **Beladi 98** (d), (1·0); **Beladi 132** (d), (1·0); **Beladi 129** (d), (1·0); **Bianrollo** (d), (1·0).

Doubbi (d), (1·0).

Einkorn, (1·0); **Emmer** (e), (1·0); **Emmer (vernal) x Iumillo** (d), (1·0).

Gaza (d), (1·0); **Greek 10** (d), (1·0).

Haurani (d), (1·0); **H–44–24 x Marquis R.L. 586**, (1·0); **H–44–24 x Marquis R.L. 590**, (1·0); **H–44–24 x Marquis R.L. 592**, (1·0); **H–44–24 x Marquis R.L. 594**, (1·0); **H–44–24 x Marquis R.L. 614** (1·0).

Iumillo (d), (1·0).

Joppa (d), (1·0).

Kenya crossbred C6042, (1·0); **Kenya crossbred C6041**, (1·0); **Kubanka** (d), (1·0); **Khapli** (e).

Mindum (d), (1·0); Marquis x Acme C5091, (1·0); Marquis x Emmer (vernal) C5089, (1·0); Marquis x Emmer C4610, (1·0).
Nodak (d), (1·0).
Palestine C2651 (d), (1·0); Palestine C2650 (d), (1·0); Palestine 1 C5361 (d), (1·0); Palestine 16 C5349 (d), (1·0); Persian Black, (1·0); Pinet (d), (1·0); Pentad x Marquis R.L. 724, (1·0).
Rossia (d), (1·0); Russian C5256 (d), (1·0); Russian C5385 (d), (1·0); Russian C5389 (d), (1·0); Russian C5258 (d), (1·0); Russian C3790 (d), (1·0).
Sinai 2 C5360 (d), (1·0); Sinai 12 C5353 (d), (1·0); Sindhi (d), (1·0).

It will be seen that most of the foregoing varieties which have been immune to stem rust in the field under the severe epidemic conditions are durum wheats, emmers and einkorns, which are of little or no value for direct culture in New South Wales, and not now of value for breeding purposes since rust-resistant varieties of bread wheats have already been evolved from some of them by crossing.

The H-44-24 x Marquis crosses come from Canada and are too late maturing for direct culture here, though they are good agronomic types from which excellent results are expected in local cross-breeding.

The Kenya crossbreds are early-maturing varieties which appear to be fixed in type and which are very promising indeed. They need to be further tested for productiveness and may possibly be definitely suited to parts of the wheat belt in New South Wales.

VERY LIGHT INFECTION (Scale 1).

Akrona (d), (1·0); Arnautka (d), (1·0).
Covelle (d), (1·0).
Duro 42 (d), (1·0); Duro 34 (d), (1·0).
Emmer (vernal) x Marquis x 138 C5084, (1·0).
Federation x Khapli C4916, (·9); Federation x Khapli C4918, (1·0); Federation x Khapli C4919, (1·0).
Hordeiform (d), (1·0); Hope, (1·0); H-44-24 x Marquis R.L. 615, (1·0); H-44-24 x Marquis R.L. 595, (1·0); H-44-24 x Marquis R.L. 609, (1·0).
Italian Spring (d), (1·0).
Khapli (e), (1·0); Kenya Governor, (1·0); Kenya crossbred C6041, (1·0).
Marquillo, (·9); Marquis x V. Emmer 14 C5085, (1·0); Marquis x Kanred x Marquillo C4594, (1·0).
Palestine (d) C5350, (·9); Poona C5411 (d), (·8); Poona C5271, (1·0); Poona C5405 (d), (·8); Pentad x Marquis R.L. 723, (1·0); Pentad x Marquis R.L. 725, (1·0); Pentad x Marquis R.L. 726, (1·0); Pentad x Marquis R.L. 727, (1·0); Pentad x Marquis R.L. 728, (1·0); Pentad x Marquis R.L. 729, (1·0); Pentad x Marquis R.L. 730, (1·0).
Russian C5391 (d), (1·0); Russian C5532 (d), (1·0); Russian C5522 (d), (1·0); Russian C5525 (d), (1·0); Russian C5260 (d), (·9); Russian C3789 (d), (1·0).

Of these wheats, the Federation Khapli crosses are the result of a cross made by Mr. H. J. Hynes, Principal Assistant Biologist of this Department. These strains are now fixed in type, and are mostly of early to mid-season maturity. They are somewhat weak-strawed and have not yet been tested for yielding ability.

Some further wheats from Kenya Colony are in this group. Kenya Governor has been found to be rather weak in the straw and inclined to shell, and cannot be recommended for direct culture. The Kenya crossbred in this group is more promising than Kenya Governor wheat, but it has yet to be tested for productivity.

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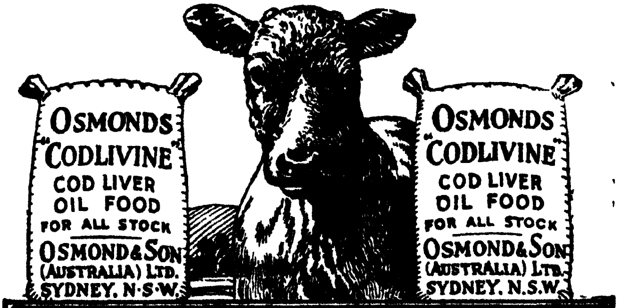

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Light Infection (Scale 2).

Akathistiko, (1·0).
Beewar, (·6); Biffen's White Fife; Big 8, (·9).
Dindiloa, (·9); Duro 46 (d), (1·0).
Federation x Khapli C4922, (·8); Florence, (·5); Ford, (·9); 45B (d), (1·0).
Gluford.
Kambouriko, (1·0); Kawvale, (·9); Kota, (1·0); Kyperounta, (1·0); Kenya Crossbred C4987, (1·0).
Lawson, (·9).
Minturki, (1·0); Maroo 386, (1·0); Marquis x Kota C4590, (1·0); Marquis x Vernal Emmer No. 20 C5090, (·9).
Pacific, (1·0); Poona C5301, (1·0); Poona C5409, (1·0); Poona C5410 (d), (·9); Poona C5407 (d), (1·0); Poona C5406 (d), (1·0); Persian C3816, (·8); Persian C3817, (·8); Progress, (·9); Psathas, (1·0).
Roumanian, (·9); Russian C5531, (1·0); Russian C5390 (d), (1·0); Russian C5243, (·6); Russian C5393, (·9).
Sinai, A C5344, (1·0); Spelz Marz, (1·0).
Three Seas, (1·0).
Warren, (1·0); Webster (Stakman), (·6.)

Beewar, Pacific and Three Seas are early-maturing Queensland wheats which may be like Florence, largely rust-escaping. Pacific and Three Seas, however, both produced much better grain samples than Florence.

Ford and Gluford are South Australian varieties of mid-season maturity which undoubtedly have a high resistance to stem rust. Ford has already yielded well in the north-west. Both these varieties are also fairly resistant to flag smut.

Lawson is a late-maturing variety bred by the Department. It appears to have definite inherent rust resistance, and is also fairly resistant to flag smut. Its productivity has still to be determined.

Warren is an old Farrer wheat which used to be grown to some extent in New South Wales, but became unpopular on account of its weakness of straw. It has stem rust resistance of a high order.

Moderate Infection (Scale 3).

A113, (·5); Amby, (1·0); Apollo.
Black Hull, (·9); Bombard, (·9); Bordan, (·6).
Ceres, (1·0); Clarendon, (·7); Correll's No. 8, (·8).
Early Haynes' Blue Stem, (·9); Emmer (Vernal) x Marquis x 131 C5086, (1·0).
Giza 7, (·9).
Hornblende, (1·0); Huguenot (d), (1·0); Hungarian C5965.
Iraq 201, (·5).
Poona C5304, (1·0); Poona C5404, (·9); Production of War No. 2 C5444, (·4).
Russian C5517, (·3).
Semiaristata, (·7); Siciliana 23 (1·0); Sonora.
Yanward, (1·0).

The varieties in this group are not worth consideration as resistant parents in crossing, but some are of promise for direct culture.

The well-known Clarendon tends to escape rust on account of its earliness, but it matured a fairly good grain sample despite its rusty appearance.

Amby, a Queensland wheat, matures a little later than Clarendon. It made an excellent grain sample despite some rust.

Apollo is a promising mid-season wheat bred by the Department at Bathurst Farm, where it has been performing well. It is well worth a trial in the north-west for its comparative rust resistance. It is also fairly resistant to flag smut.

Bombard is rather too late maturing, grows too tall and shatters. Bordan is a South Australian wheat which will be further tested.

Correll's No. 8 is a late-maturing West Australian wheat with tall straw which is also worth testing further.

Early Haynes' Blue Stem was once grown on the Northern Tableland, and is certainly more resistant to stem rust than the varieties recommended at present. It may be worth reviving there.

Giza 7 is an early Egyptian wheat which will be further tested.

Yanward is a late-maturing Victorian wheat which has a measure of inherent rust resistance. It matured an excellent sample of grain, but it is weak strawed.

HEAVY INFECTION (Scale 4).

Anchor, (·9); Agate, (3); Alcorn, (·8); Amazon, (9)
Baringa, (·8); Blount's Lambrigg, (·6); Bredford.
Caird, (·6); Canimbla, (·6); Cedar, (·5).
Dan, (·5).
Geeralying, (6), Gwalior V19, (·4).
Linden, (·6).
Marquis, (·4); Minflor I. C5878.
Nabawa, (3).
Rodite, (·3); Rymer, (·7).
Sword, (·8).
Tuela, (2); Thew, (·4).
Yetna, (·4).

From this and subsequent groups a large number of introduced varieties have been omitted. Although the infection was heavy in the above varieties, and few good samples of grain were produced, it must be borne in mind that the epidemic was one of great severity, and that many of these varieties would perhaps be classed as comparatively resistant to rust under conditions of lighter infection. The fact remains, however, that conditions of such severe infection are likely to be present in which these varieties become badly attacked and produce only poor grain samples.

Baringa is a comparatively new Departmental wheat which is definitely productive at many experiment farms. Its chief defect is a rather too tight grain-holding capacity.

Bredford, Caird, Dan, Rodite, Sword and Tuela are mid-season to late South Australian wheats which require further testing.

Canimbla and Nabawa are well known wheats which are certainly more resistant to stem rust than many other varieties, but the experience at Glen Innes last season indicates that they may suffer badly in years of severe infection.

Geeralying is a very early Western Australian wheat which is certainly worth a trial in the north-west. It is a little more susceptible to stem rust than Clarendon, but has the quality of high resistance to flag smut.

Rymer was once grown to some extent in New South Wales, but went out of favour on account of weak straw. It is also flag smut resistant.

Yetna is a mid-season wheat from Western Australia which seems productive, and may be worth further testing in the north-west.

VERY HEAVY INFECTION (Scale 5).

Adage, (·4); Arrow, (·2); Astor, (·2); Aussie, (·2).

Baldwin, (·3); Basil, (·2); Beaumont, (·1); Bencubbin, (·4); Bland, (·2); Bomen, (·7); Brevet, (·4); Bulga, (·1); Burnham, (·3); Burrill, (·7); Barwang, (·5).

Calare, (·4); Capeton, (·2); Carinda, (·5); Cargo, (·3); Carlton, (·3); Cedric, (·5); Clarke's, (·5); Cleveland, (·3); Clunes, (·5); Coobang, (·5): Copeland, (·6); Cowan, (·2); Currawa, (·6); Currimp, (·6).

Daphne, (·3); Dargum, (·5); Dart's Imperial, (·3); Dilga, (·1); Duri, (·4).

Early Bird, (·5); Early Red Fife, (·3); Early Triumph, (·5); Equator, (·4); Euston, (·2).

Fay, (·3).

Garra, (·2); Genoa, (·4); Gidley, (·2); Girral, (·2); Gluyas Early, (·4); Goolma, (·5); Gunyah, (·5).

Hunter, (·6).

Jindera, (·7); John Brown, (·4).

Kanred, (·3); Kerley's Wonder, (·1); Koongi, (·5).

Lambert, (·1); Leake's Rustproof, (·6).

Major, (·5); Maharajah, (·7); Mardi, (·2); Marshall's No. 3, (·4); Morven, (·3).

Narellan, (·2).

Parsee, (·4); Petatz Surprise, (·2); Pilot, (·5); Pusa 4, (·3); Pusa 52, (·5); Pusa 80-5, (·5); Pusa 107, (·7).

Reliance, (·8); Rerraf, (·5).

S.H.J., (·8); Strongbolt, (·2).

Tamar, (·4); Turvey, (·6).

Viceroy, (·7).

Waratah, (·5); Warchief, (·9); Warrior, (·5); Ward's Prolific, (·4).; Wangan, (·3); Wandi, (·3).

Yandilla King, (·4); Yok, (·8).

Zealand, (·2).

Such well known varieties as Cleveland, Currawa, Dart's Imperial, Duri, Early Bird, Genoa, Gluyas Early, Major, Marshall's No. 3, Pusa 4, Turvey, Waratah, Yandilla King and Zealand fall into this class. That is, they are very susceptible to stem rust and do not make an f.a.q. grain sample under severe rust conditions, though some of them may do so when rust is not of great severity.

It is to be noted that early varieties such as Early Bird and Pusa 4 have not sufficient inherent resistance in comparison with other early varieties to escape the effects of rust under these conditions. Likewise, Cleveland, Currawa, Genoa and Marshall's No. 3, although at present grown to some extent in rust liable districts such as the Tablelands and the North-western Slopes, cannot stand up to a severe infection.

EXTRA HEAVY INFECTION (Scale 6).

AO 89; Abbott, (·6); Agrion, (·2); Ainslie, (·5): Akubra, (·3); Amber, (·2); Argus, (·3); Atlas, (·4); Auction, (·1).

Bald Early, (·1); Baroota Wonder, (·1); Begum, (·2); Bena, (·4); Bobin, (·2); Bogan (·2), Bowes, (·3); Bredbo, (·6); Bunyip, (·6); Bunge, (·2).

Cadia, (·4); Caliph, (·1); Camira, (·5); Canberra, (·1); Carrabin, (·1); College Purple (·3); Colo, (·1); Comeback, (·1); Condong, (·2); Confederation, (·3); Cookapoi, (·2); Craboon, (·2).

Dollar, (·4); Droophead, (·4); Duke of York, (·5); Duchess, (·3); Dundee, (·3); Dunmore, (·5).

Elfin, (·3); Exquisite, (·1).
Firbank, (·1); Fawn, (·2); Federation, (·2); Felix, (·1); Firwill, (·4); Flora, (·1); Florida, (·9); Free Gallipoli, (·4).
Gallipoli, (·7); Gem, (·8); Gresley, (·4); Gular, (·5); Gullen, (·3).
Hard Federation, (·5).
Little Club, (·0).
Mallan, (·3); Millennium, (·1).
Narwonah, (·4); Nizam, (·4); Nolba, (·4); Noongar, (·3); Novo, (·7); Numba, (·2).
Onas, (·2).
Patriot, (·3); Penny, (·3); President, (·3); Pusa 6, (·6).
Queen Fan, (·3).
Ranee, (·3); Rajah, (·2); Regal, (·2); R.I.P., (·3); Riverina, (·4).
Sands, (·3); Silver Bart, (·3); Stamina, (·4); Sterling, (·3); Sultan, (·4).
Union, (·3).
Wandilla, (·5); Wannon, (·4); Waterman, (·1); Wilfred, (·4); Windsor, (·3).

In this group the following well-known varieties occur:—Bald Early, Baroota Wonder, Bena, Bobin, Bogan, Bunyip, Cadia, Caliph, Canberra, College Purple, Comeback, Cookapoi, Droophead, Duchess, Dundee, Exquisite, Firbank, Federation, Firwhill, Free Gallipoli, Gresley, Gullen, Hard Federation, Nizam, Numba, Onas, Penny, Queen Fan, Ranee, Rajah, Riverina, Sultan, Union and Wandilla.

These wheats were more severely infested by rust than others, all producing grain far below f.a.q. standard. Some of these wheats are still grown in rust liable districts, and farmers in these districts are subjecting their crops of these varieties to a definite risk of total loss from stem rust, which is entirely unnecessary when more resistant varieties can easily be obtained.

The usual Winter School for farmers at Hawkesbury Agricultural College, Richmond, is to be held this year from 30th June to 17th July. The poultry farming course extends over the whole of that period, while the dairy farming and horticultural courses commence on the 7th and end on the 17th July.

TRIALS WITH MID-SEASON WHEATS AT CONDOBOLIN.

The mid-season wheats under trial at Condobolin Experiment Farm last season were sown on 7th May, the condition of the soil at planting time being very satisfactory. Seeding was at the rate of 66 lb. per acre, with 60 lb. superphosphate. The yields were as follows, the figures in parentheses being the average percentage yield based on the yield of the standard variety for whatever number of years the variety has been under trial:—Cookapoi, 31 bus. 39 lb. (101.2 per cent.); Duri, 31 bus. 39 lb. (101.2 per cent.); Canberra, 31 bus. 15 lb. (100 per cent, standard); Geeralying, 31 bus. 9 lb. (97 per cent.); Aussie, 30 bus. 39 lb. (98 per cent.); Riverina, 29 bus. 18 lb. (88.8 per cent.); Euston, 29 bus. 3 lb. (90.6 per cent.); Ainslee, 28 bus. 15 lb. (94.1 per cent.); Gullen, 27 bus. 24 lb. (87.6 per cent.); Waratah, 26 bus. 48 lb. (85.7 per cent.); Morven, 26 bus. 39 lb. (87.2 per cent.); Girral, 26 bus. 18 lb. (84.1 per cent.); Ranee, 24 bus. 30 lb. (78.4 per cent.); Sepoy, 19 bus. 18 lb. (61.7 per cent.); Gallipoli, 18 bus. 48 lb. (60.1 per cent.).

Possible Relationship of Crown Gall in Plants to Cancer.

G. P. DARNELL-SMITH, D.Sc., F.I.C., F.C.S., Director of the Botanic Gardens, Sydney.*

When Darwin published his *Origin of Species* in 1859 he referred, in the introduction, to the origin of the species as the mystery of mysteries and said that it occurred to him in 1837 "that something might be made out of this question by patiently accumulating and reflecting upon all sorts of facts which could possibly have any bearing upon it."

To-day in regard to disease one would perhaps be justified in referring to cancer as the mystery of mysteries, and perhaps by patiently accumulating and reflecting upon all sorts of facts which could possibly have any bearing upon the subject the mystery may at length be solved.

When we reflect that the cell was first discovered by a botanist and that the nucleus was discovered by a botanist, and that the whole superstructure that has been built up in histology and physiology rests upon a knowledge of cells and their behaviour, it appears possible that the plant world may contribute its quota to the solution of the mystery.

Various tumors occur in the plant world, just as they do in the animal kingdom; some are benignant, others malignant. Among the benignant tumors may be placed the swellings that occur on the roots of leguminous plants and upon some of the native she-oaks and which aid in the fixation of nitrogen. Tumors of an intermediate type are those that arise from an artificial arrest of the normal flow of sap, and among tumors of a malignant type may be placed crown galls. As the name implies, these latter tumors arise mostly just at the ground level, and they have been shown to be caused from infection by a micro-organism, *Bacterium tumefaciens*. In their mode of growth they have been shown to resemble the tumor of cancer, inasmuch as there is no definite line of demarcation between the periphery of the tumor and the surrounding tissue; in other words, there is infiltration.

In plants, tumors are frequently caused by continuously interrupted healing. Thus an apple root that has been attacked over and over again by woolly aphis presents such a conglomeration of tumors that it is almost impossible to recognise the original root. In trees where a wound is produced by frost and an attempt is made by the tree to heal the wound by the growth of fresh tissue, a cankerous swelling may be produced if this young tissue is injured by frost each time new growth develops. Tumors may be produced in the roots of plants that are continually attacked by eelworms.

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* Resume of an address delivered by Dr. Darnell-Smith before the Institute of Stock Inspectors, N.S.W., 1931.

All plants and all animals start life as a single cell, which, after fertilisation, develops through well defined stages to the adult. For convenience, the various tissues in animals and plants are classified and named, but their origin from a single cell must not be lost sight of. It has been shown that actual fertilisation is not necessary to induce the ova of some simple forms of life to multiply; irritation of the cell wall by chemical or mechanical means suffices and the suggestion is put forward that the cells of an adult plant or animal will multiply if the cell walls are irritated continuously or intermittently. If the irritation is continued over a sufficient period of time multiplication of cells becomes abnormal, and if the surrounding tissue is becoming effected through age, hereditary pre-disposition, or a long-continued physiologically wrong course of living, invasion takes place and cancer results. A cancer cell is a cell which is out of physiological control. After a survey of the literature on cancer, it will be borne in upon us that there is no common cause of all cancers.

In comparing abnormal growths in plants and in animals, the following summary may be made:—

Abnormal growths in plants may be brought about by bacteria, by fungi, by parasitic worms, by chemicals and by continuously interrupted healing.

Cancerous growths in animals may be brought about by a filterable virus, by parasitic worms, by chemicals and by continuously interrupted healing.

Infiltration is generally present in cancerous growths in animals; in plants a somewhat similar process has been shown to take place in the case of crown gall.

Owing probably to the presence of a lymphatic and a circulatory system in animals, metastases may accompany malignant growths; plants possess no such systems and no true metastases have been found. In animals the majority of cells, perhaps all of them, are normally under the control of the nervous system; in plants no system comparable to the nervous system of animals exists.

Since the causes of cancer may be various, and since the rapid multiplication of cells precedes invasion, we may inquire what places the cells in the condition to multiply rapidly. The theory is put forward that when a tissue is wounded the first step towards healing is that it must revert to the primitive condition. Fresh tissue is then formed, and if the surrounding tissues are in a proper state of tone, normal healing takes place. But if when healing is taking place the primitive tissue is again and again irritated, it remains permanently in the primitive condition, more and more is produced, it gets out of control and invades the surrounding tissue, giving rise to a cancer, especially if the surrounding tissue is not in a proper state of tone. In the Australian flora we have striking examples of reversion to the primitive condition upon being wounded. It is well known that eucalypts have a typical juvenile foliage; the leaves are bluish-grey in colour, they are opposite in position, or nearly so, and they are symmetrical, being usually more or less heart-shaped. In the adult eucalypt the leaves are more or less green in colour, they are alternate in position, and they are not symmetrical. But if an adult eucalypt tree is wounded at its base, or if the end of a branch is cut off, the tissue reverts to the primitive condition and produces for months the typical juvenile foliage. In acacias we have a similar phenomenon; several of the species readily revert to the juvenile pinnate foliage if wounded.

According to this theory, the failure to transplant a cancerous tissue from one animal to another of a different species is capable of explanation, so also is the theory of "rests," and so also is the failure of the majority of cures. It is the cause that must be removed, and since cancer occurs in special localities in different domestic animals, it is perhaps to the veterinary profession that we must look for great contributions to the control of the disease.

SUPERIORITY OF WHITE TARTARIAN OATS AT GLEN INNES.

THE trials with spring-sown oats at the New England Experiment Farm, Glen Innes, have so far not brought to light any variety to rival White Tartarian. In last year's trials Bombo and Algerian were outyielded in both the hay and grain sections. The yields were as follows:—

YIELDS in the Hay Trials.

Variety.	Average Yield Per acre.				Percentage Yield. (Standard variety = 100 per cent.)
	t.	c.	q.	lb.	Per cent.
White Tartarian	1	12	0	26	100
Bombo	1	5	1	12	78·7
Algerian	1	2	1	8	69·3

YIELDS in the Grain Trials.

Variety.	Average Yield Per Acre.		Percentage Yield (Standard variety = 100 per cent.)
	bus.	lb.	Per cent.
White Tartarian	32	20	100
Bombo	19	0	58
Algerian	18	20	56·5

In reporting on these trials, Mr. S. C. Hodgson, Experimentalist at the New England Experiment Farm, incidentally mentions that the varieties Reid and White Tartarian are now regarded as identical and are grown under the name of White Tartarian.

Of her annual consumption of potatoes, New South Wales produces approximately only one-half. An ample market, therefore, awaits the local grower at his very doorstep.

Starter for Cheddar Cheese-making.

ITS PREPARATION AND CONTROL.

H. H. RANDELL, Assistant Bacteriologist, and A. B. SHELTON, Senior Dairy Instructor.

FOLLOWING the introduction of the process of pasteurisation of milk for cheese-making into factories in New South Wales, the disabilities surrounding the then current methods of propagating and maintaining a starter in a pure and vigorous state became apparent, and it became urgently necessary to design an entirely new method or adopt some known laboratory practice to enable pure or mixed cultures to be maintained under factory conditions in a vigorous growing condition, and to allow of their being utilised to inoculate required quantities of "mother starter" and "bulk starter" without detrimental contamination.

The simple method outlined in this article has been in operation in a number of factories for some time, and no difficulty has been experienced by cheese manufacturers in adapting themselves to the new system. The results obtained, so far, have been very satisfactory, and point to a definite and permanent uplift in the quality of cheddar cheese.

The Function of the Starter.

In the manufacture of milk products "starter" is a term applied to any culture of viable specific micro-organisms in milk or other medium or base, which it is desired to introduce into a product during manufacture for the purpose of bringing about a particular fermentation.

Different species of micro-organisms are used for varying purposes and are cultivated in the form of starter to bring about the nucleus of the desired biological action in different milk products. Thus, in the manufacture of margarine, and many varieties of cheese (and, in some countries, butter) selected strains of lactic acid bacteria are cultivated in skim-milk or whole milk for use as starter. Species of Lactobacilli are employed in making varieties of Swiss cheese, and are cultivated in milk or albumen-free whey. In the manufacture of cheese of the blue-veined variety, certain species of moulds, which are often cultivated on straw mats or sterilised breadcrumbs, are brought into contact with the cheese curd prior to processing or during ripening.

The Streptococcus Lactis Group.

We are concerned principally with the preparation and control of starter containing those types of lactic acid bacteria which are commonly employed in the manufacture of cheddar cheese, and which belong to the group known as the *Streptococcus lactis* group. Members of this group are very widely distributed, and can always be found in milk and milk products and on dairy utensils. Apart from the normal souring of milk, which they cause, different members of the group behave differently when grown in pure culture in milk. These differences are important, since they render some members unsuitable as starter organisms. Hammer and Baker,* after investigating the behaviour of a considerable number of pure cultures that would ordinarily be classed as *Streptococcus lactis*, proposed a classification of the group emphasising the important differences from the standpoint of the growth of these organisms in dairy products. The differences to which they refer involve flavour and aroma production, the development of "ropiness," reducing power, rate of coagulation, and temperature requirements.

Malty Flavoured Starter.

Exclusive of "fruity" and other off-flavours caused by contamination of the starter milk by organisms which are not members of the *Streptococcus lactis* group, the foreign flavours most commonly encountered in starters are rank acid, bitter and caramel or malty flavour. The prevalence of this last-mentioned flavour in cheese has been viewed with anxiety by cheese manufacturers, who assert that buyers do not desire malty flavoured cheese. The causal organism (*Streptococcus lactis*, var. *maltigenes*) is prevalent in milk and on dairy and factory utensils throughout the whole year. In competition with other strains of lactic acid bacteria, malty *Streptococci* soon gain the ascendency, and milk containing them, under favourable temperature conditions, will readily develop the characteristic malty taste and aroma.

"Ropy" Starter.

A common defect in starter is "ropiness." This condition may appear suddenly in a starter which has previously given satisfactory results, and then it may just as suddenly disappear. Sometimes it persists, and so increases in intensity that the starter has to be discarded. The development of "ropiness" in non-ropy cultures appears to be associated with the influence of air (oxygen), and may often be induced by repeatedly inoculating milk at the surface. When making daily transfers of culture into milk, the inoculum should be added carefully and well stirred in. Should ropiness appear in the cultures carried on in test tubes, allow the milk in the tube to become firmly coagulated, and make a transfer from the culture at the bottom of the tube. To avoid undue contamination and irregular fracture of the tube, sterilise the base of the tube by passing it through the flame of a spirit lamp, then take a sharp, three-cornered file (also sterilised) and scratch around the tube about half an inch from the end. Gentle tapping will break the end off the tube, exposing the clean surface of coagulated milk from which a new culture can be made.

Strains of Lactic Acid Bacteria Used in Starter.

The importance of selecting suitable strains of lactic acid bacteria for propogation and use as starter cannot be over-emphasised. In the past, many cheese manufacturers were content to use natural starter, prepared by allowing a sample of milk from some so-called "clean" dairyman to sour or thicken spontaneously. Cultures prepared in this way will invariably contain many undesirable types of bacteria, and their use can only be attended by results which are uncertain.

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* Hammer, B. W., and Baker, M. P.—"Classification of the Streptococcus lactis group." Iowa State College of Agri., Res. Bul. No. 99, 1926.

In modern factory practice the cultures used are prepared scientifically in properly equipped laboratories. The starter cultures at present available to cheese manufacturers include the commercial lactic ferment supplied in powder form from overseas laboratories and the culture supplied by the Biological Branch of the New South Wales Department of Agriculture. The powder culture, or commercial lactic ferment, consists of lactose as a base, and contains several varieties of *Streptococci*. These include *Streptococcus lactis,* which readily produces lactic acid from milk sugar, and *Streptococcus citrovorus* or *Streptococcus paracitrovorus,* or both. The research work of Hammer and Bailey* has shown that *Streptococcus citrovorus* and *Streptococcus paracitrovorus* are present in good commercial starters, and their importance is characterised by their ability to produce large amounts of volatile acid, which, they suggest, is largely responsible for the development of the aroma in butter. Orla Jensen believes that volatile acids in cheese are important from the standpoint of flavour production. Hucker and Marquardt† showed that *Streptococcus paracitrovorus* when added to milk either in conjunction with commercial starters or alone, appears to have a decided effect upon the flavour of cheddar cheese and considerably hastens its development. They also found that when a pure culture of a selected strain of *Streptococcus lactis* was used as a starter the cheese produced was very similar to that produced with commercial starters.

The cultures supplied by the Department of Agriculture consist of a selected strain of *Streptococcus cremoris.* In the laboratory this organism is propagated in sterilised skim-milk, but is transferred to the surface of nutrient agar slopes for transit to the factories. This precaution is taken because agar slope cultures are conveniently handled both at the factory and laboratory, and should delay occur during transit or in making new transfers at the factory, the viability or vigour of the culture is not affected as is often the case when milk is used as a culture medium.

The associated types of *Streptococci* have been purposely excluded from the cultures supplied by the Department on account of insufficient proof of their necessity under New South Wales conditions. Should an investigation which is in progress show any advantage in their use in cheese starter, then the method of controlling starter and culture suggested in this publication can be applied to ensure the inclusion of ample numbers

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*** Hammer, B. W., and Bailey, D. E.—"The volatile acid production of starters and organisms isolated from them." Iowa Agr. Expt. Stn., Bul. 55, 1919.**

† Marquardt J. C., and Hucker, G. J.—"The effect of certain lactic acid producing Streptococci upon the flavour of cheddar cheese." N.Y. Agr. Expt. Stn., Tech Bul. 118, 1926.

of volatile acid forming *Streptococci* in the cheese milk. At the present time, however, cheddar cheese of excellent flavour is manufacturd from pasteurised milk with the aid of starters containing *Streptococcus cremoris* alone. The essential characteristic of this organism is the production of true lactic acid from milk sugar, which readily combines with the mineral salts and curd constitutents to assist in the formation of a curd which expels moisture and drains well, favouring the correct development of texture and body in cheddar cheese.

Pasteurisation of Milk for Cheese Manufacture.

While the policy of instructing farmers in the proper methods of producing and handling milk undoubtedly assists in the production of a more uniform quality cheese, difficulty is still experienced in many cheese districts, particularly during the summer months, in making satisfactory cheese from unpasteurised milk.

The beneficial effect of pasteurisation is indicated by the following results of bacteriological examinations which were obtained recently while investigating the conditions affecting the quality of cheese milk. The samples examined included the evening and morning milk sent to a cheese factory from twenty-five different dairy farms. Bacterial counts in the different samples varied considerably—the lowest count was 100,000 and the highest 3,000,000 bacteria per c.c. The mixed milk showed an average count of 1,000,000 bacteria per c.c. Pasteurisation by the Flash method at 163 degrees Fahr. reduced the count of organisms in the milk from 1,000,000 to 50,000. The types of bacteria which survived were mostly varieties of *Streptococci*, and were not considered detrimental in cheese. The pasteurisation of milk for cheddar cheese-making may be considered as a necessary adjunct to the proper use of starter prepared under controlled conditions, but it cannot be regarded as a means for the satisfactory renovation of low-grade milk, or permit of carelessness in the cleaning and scalding of utensils which come in contact with the milk subsequent to pasteurisation. The process destroys large numbers of undesirable gas-forming and milk-souring bacteria which are normally present in milk, thus providing a favourable medium for the growth of the added starter organisms.

There are two common methods by which cheese milk may be pasteurised successfully. These are the Flash method and the Holding method. The Flash method of heating cheese milk to 163-165 deg. Fahr. and cooling immediately by means of a pipe surface cooler has been favoured in New South Wales factories on account of its continuity, simplicity, and the time saved in the cooling process. In the use of this method, however, it is important to avoid exceeding a maximum temperature of 165 deg. Fahr. in order to prevent the reaction which may affect the mineral salts and destroy certain active principles which are important in the subsequent maturation of the cheese.

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Orchard Notes.

JUNE.

C. G. SAVAGE and R. J. BENTON.

Marketing the Citrus Crop.

IN practically all citrus-growing areas harvesting and marketing of the crop will be an urgent matter this month. Unfortunately, it appears very probable that considerable difficulty will be experienced in obtaining profitable returns. The crop of midseason-ripening fruit is quite a good one, despite variation in some localities, and in the absence of organised distribution, glutted markets may be anticipated at times. In these circumstances it is recommended that each grower market his crop regularly and over as long a period as possible. Failure to do this is certain to result in an accumulation of supplies later, with attendent greater loss of fruit and relatively higher cost.

The necessity for presenting the best quality fruit in the most attractive manner is likely to be of even greater importance this season than usual. Frequently good quality fruit, well packed in a good and sometimes a new case, is marred by a hastily applied label which does not convey a description of the contents in an attractive manner. Attractiveness is governed by the kind and condition of the case, by the design of the label and quality of the paper used, as well as by the neatness and legibility of the description of the contents, which has to be written or rubber stamped on the label. These points may be considered to be of minor importance, but they denote attention to detail, which, on occasions, will be a factor influencing a sale.

The production and preparation of fruit for market should be conducted along standardised lines in a similar manner to many other articles of commerce.

The Question of Apple Varieties.

Mr. W. W. Cooke, Senior Fruit Instructor, has pointed out that the advantages of having a sufficient number of trees of one variety to pick from cannot be too strongly advocated. This enables the orchardist to market a sufficiently large "line" of fruit to attract the notice of the better buyers. His brand becomes well known and looked for, grading and packing are improved and simplified, and the disadvantage of having to pick the whole of the fruit on the trees at one time to obtain even a small consignment is avoided.

In spite of these disadvantages, some orchardists still plant only a few trees of some varieties, and, what is worse, they often plant worthless kinds. It is almost impossible to market the fruit from such small numbers of trees profitably, and in some cases the failure of an orchard to yield a reasonable profit may be largely attributed to this cause. Excluding a limited number of trees planted to meet local requirements only, many growers are concentrating on such varieties of apples as Granny Smith, Delicious, Jonathan, Tasma, Rome Beauty, and Yates, and in the case of pears, upon Williams, Packham's Triumph, Winter Nelis, Winter Cole, Josephine, and Beurre Bosc. Even this limited list can often be reduced with advantage by selecting from it varieties that have been proved to be suitable for the district or a particular part of the district in which they are to be planted. When reducing the number of varieties, cross-pollination should not be overlooked, but with the exception of Rome Beauty, it is possible to make such provision when selecting from the varieties mentioned above.

Provided the ground is in good order, early planting of deciduous trees is advisable. Root growth commences soon after planting; thus trees planted in June have an advantage over those planted later in the year. That it pays to plant only healthy, young, and well-grown trees has been proved repeatedly.

Varieties for the Young District.

In the Young district, Mr. S. A. Thornell, Fruit Inspector, points out, there are approximately 1,400 acres under apple trees, comprising the following varieties:—Granny Smith, Rome Beauty, Statesman, Cleopatra, King David, London Pippin, Tasma, Delicious, and a number of miscellaneous varieties. It is questionable if many of these show a payable return, for some are not suitable for local climatic conditions. Many could with advantage be eliminated and only the proved money-makers concentrated on, such as Granny Smith, with just sufficient of Statesman and Cleopatra to ensure inter-pollination, a small proportion of Rome Beauty, and a very limited number of Williams Favourite and Alexander. It would be preferable to keep the Cleopatra and Statesman off the Sydney market where they are not favoured, sending them direct to the country markets.

Work on the Irrigation Areas.

Discussing current work on the Irrigation Area, Mr. G. W. Beverley, Senior Fruit Instructor, has drawn attention to the fact that the finishing up of the drying season generally leaves a considerable amount of cleaning up work to be done in the orchard. Owing to the heavy spells of wet weather during the past drying season the weeds in many cases made rapid growth, and an early ploughing is advisable. This will enable the winter rains to penetrate the subsoil and conserve the moisture, and probably enable the grower to do without the first spring irrigation, with great benefit to the setting of the vines, especially the two varieties Sultanas and Ohanez. Ploughing alternate lands between the trellises will leave the unploughed pieces ready for the reception of the cuttings when the pruning commences. With trees, the whole of the land may be ploughed. A dressing of phosphatic and potassic fertilisers may be worked in at the time of ploughing if desired, and the balance of the manure ploughed in when the remainder of the land is ready to be worked up.

Some Spraying Reminders.

Trees that have shown any sign of rust during this season should be sprayed with Bordeaux mixture at a strength of 6-4-22 before the buds burst. Be careful also to burn all cuttings and, as far as practicable, plough in deeply fallen leaves.

Attention to all farm implements and spray pumps is of great importance, and is often neglected. Many implements are left out in the open from season to season, when they should be under cover from the weather. It should be the usual practice to go carefully over all implements and other orchard apparatus and to see that it is put away in good order so as to be ready for immediate use the following season. The wooden portion of any implement should receive a good coating of paint or oil to preserve it.

Care of the Drying Trays.

If this work is not done at the end of each season it may cause a serious loss by delaying spraying operations early in the season, especially if adverse weather conditions are met with. Correct time of application of sprays is one of the main factors in successful control of most fungous diseases and insect pests, and the correct period is often of short duration.

Another matter that does not often receive the attention it should is the thorough cleaning and mending of drying trays at the end of the fruit season. It is easier to turn out a good dried article, especially in the case of apricots and peaches, if the trays are clean, than if the remains of overripe fruit or juice still adhere to the wood. It does not take a great deal of time to scrub drying trays, and few growers have more than a few hundred of them, and if this practice is followed the trays will be kept in better order. The dip tank with the water warmed up to a heat in which one can place the hands with comfort, will be found a useful means of cleaning up the trays and the addition of half a kerosene tin of gypsum to the water will take a lot of the soda lye out of the wood and leave the trays whiter and less splintery than if caustic soda is used.

Red Scale on the Irrigation Areas.

Some controversy has taken place of late in regard to the efficacy of spraying versus fumigation for red scale, and experiments have been carried out at Griffith to test the merits of both systems. Fumigation as a rule gives a more thorough kill of scale than spraying, while on big dense trees the white oil sprays are more costly than fumigation.

The red scale menace is fast spreading, and unless growers carefully watch their trees the pest will obtain a serious hold, with a subsequent depreciation in values of the fruit and a marked deterioration in the health and vigour of the trees.

There is very little red scale on citrus fruit in that part of the Yanco Irrigation Area known as the No. 1 Pumping Scheme, and in the Yenda district it is understood to be non-existent. A proclamation has, therefore, been gazetted under which all occupiers of land within these two districts are required, within twenty-four hours after observing or becoming aware of the appearance of red scale, to give written notice to an Inspector under the Plant Diseases Act, or to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney. This will enable prompt measures to be taken to deal with any outbreak that may occur at any time.

The Banana Position.

Before definitely deciding to plant bananas next season, prospective growers are advised by Mr. H. Eastwood, Fruit Instructor, to survey the position of the industry as it exists to-day, and then endeavour to visualise what it will be when next season's plantings come into bearing. Within the last four years the area under bananas has increased from 1,846 acres to over 7,000 acres—1,500 acras more than the peak year of 1922. If this rate of progress continues in the next few years the industry is not likely to remain in an economically sound position.

Even if the area remained stationary at its present figure, in two years hence production, estimated at eighty cases per acre per year (which is a conservative estimate), will amount to a total of 560,000 cases—100,000 cases in excess of the record yield of 1922. The present markets, unless distribution methods improve, seem incapable of absorbing this anticipated production at payable prices to the producer, and further plantings next season will aggravate the position.

If, after careful consideration, growers are still satisfied to plant, they should begin their new areas with all possible natural advantages. This would mean planting only in good soil, in a well-sheltered position with an easterly to northerly aspect, so as to gain protection from prevailing winter winds and frosts, and get as much sun as possible.

Preparations for Planting.

Preparations for planting bananas next season in virgin country—which is undoubtedly the best if available—should commence this month, if not already under way. It is necessary to have the timber down at least three months to obtain a good burn in the spring. As lantana dries out much quicker than either scrub or forest, the brushing of it can be delayed until six or eight weeks before planting is to commence.

To minimise the likelihood of poor burns, which were frequent last year, good felling and sufficient time between felling and firing are important. Before putting an axe into the trees, all undergrowth should first be brushed. As it is the undergrowth and trash which carry the fire through the fallen timber, they require to be well beaten down and compacted. In heavy and big timber this may not be necessary, as the heavy trees will crush the undergrowth, but where the trees are small or sparse, good brushing and cutting up of the undergrowth are essential. Lantana needs chopping up when brushing to get a good solid mass to fire successfully.

All trees should be felled cleanly, making sure they are freed from the stumps remaining. Any trees slightly connected to the butts by strips of wood or even bark remain green, and when fired do not burn readily.

A bad burn results in much extra and unnecessary work in cutting and logging up afterwards to get rid of the debris before planting, and time is very valuable during the planting season.

Cigar End Disease.

The occurrence of cigar end disease in bananas is closely related to seasonal conditions. It appears as a firm black rot at the flower end of the fruit and the affected part shrivels and eventually assumes a greyish colour, resembling the ash of a burnt cigar, from which it derived its name.

Control measures suggested are as follows:—

(1) Avoid planting in low situations, cold pockets, and on southern and western slopes of land.

(2) Allow as much sunlight and air into the plantation and on to the bunches as is possible.

(3) Remove any flower bracts on newly thrown bunches as soon as it is safe to do so.

(4) Remove affected fingers on bunches to prevent the likely spread to sound fruit.

(5) Dusting the flower ends only of the fruit with copper-lime (Bordeaux) dust when the bunches are out sufficiently but still in the immature stage may be given a trial.

Alterations to Banana Regulations.

In order to secure the greatest efficiency in the work of combating bunchy top disease and borer in bananas, certain amendments of the Regulations have been found necessary. Growers should make themselves familiar with the alterations, which were gazetted on 24th April.

LEAVES OF TREES POISONED WITH ARSENIC NOT HARMFUL TO STOCK.

THE question as to whether the leaves of trees poisoned with sodium arsenite are harmful to stock was investigated by the Department's Veterinary Research Station at Glenfield.

A young eucalypt was frilled and poisoned in the usual way, except that considerably more arsenic solution was used in order to ensure the maximum absorption of arsenic by the tree. When the majority of the leaves died they were collected, mixed with chaff, and fed to a 9 months old calf. During the period of feeding (ten days), the animal consumed the whole of the dead leaves (13½ lb. weight), but remained normal, thus demonstrating that there is no danger to stock from eating the leaves of trees poisoned with arsenic.

A note of warning is sounded, however, in that there is a danger of the arsenic solution being spilt on the grass, etc., around the butts of the trees, and as herbage *sprayed* with arsenic has been shown to be toxic, every care should be taken when poisoning trees to guard against poisoning of stock from vegetation over which the arsenic has been intentionally unintentionally spilled.

IMPORTS AND EXPORTS OF FRUIT.

THE following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st March, 1931:—

Description.	Imports.	Exports.
Interstate.	Cases.	Cases.
Fresh Fruit ..	531,567	97,529
Tomatoes ...	39,308	...
	bunches.	
Bananas	2,022	...
	cases	
" ..	20,579	...
Pines . ..	13,625	
	Crates	...
Melons	27	
		...
	lb.	lb.
Canned Fruit ..	131,516	392
Dried Fruits—		
Unspecified ...	4,676	112
Currants ...	2,128	56
Raisins ..	2,660	112
Apricots ...	784	..
Apples ...	616	...
Peaches ...	280	...
Pears	168	...
Prunes ...	1,484	75,488

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals.
Apples ..	....	...	14,158
Bananas ...	....	6,409	55
Lemons ...	....	94	120
Oranges ..	....	...	1,565
Grape Fruit ..	....	169	
Pears	....	...	3,115
Pineapples ...	....	...	1,388
Other	....	419	3,267
Dried Fruits—		lb.	lb.
Apples ...	....	...	380
Apricots ...	....	...	4,740
Currants .	....	...	28,270
Figs	Greece	2,456	...
	U.S.A	13	...
Peaches ...	....	...	10,957
Prunes ...	....	...	1,928
Raisins—			
Sultanas ..	....	...	355,850
Lexias ...	....	...	14,184
Other ..	....	...	1,648
Dates	Mesopotamia ...	226,923	7,179
Other	U. K.	309	1,298
	China	1,294	
	Japan	3	
Preserved in liquid—			
Apricots ...	....	...	265,195
Peaches ...	....	...	524,370
Pears ...	....	...	1,706
Pineapples ...	....	...	436
Raspberries	....	...	266,606
Other ...	....	Gallons. 787	11,158

"MAIZE IN SOUTH AFRICA."

A USEFUL book, "Maize in South Africa," by A. R. Saunders, has reached us from the publishers, the Central News Agency Ltd., South Africa. The author is the senior research officer in summer cereals of the South African Department of Agriculture.

The book opens with a discussion on the origin and importance of maize, and goes on to deal with, particularly in relation to South Africa, of course, such subjects as climate in relation to maize production, the botany of the maize plant, formation and classification of maize soils, fertilisers and crop rotation, planting, cultivation and harvesting, varieties, diseases and pests, breeding and seed selection, the uses of maize, concluding with a chapter on commercial side of the maize industry. It contains 274 pages and is well illustrated.

Poultry Notes.

JUNE.

E. HADLINGTON, Poultry Expert.

ON all commercial poultry farms hatching operations should be commenced early this month; it matters not whether light breeds or heavy are to be hatched, the earlier a start is made the better. The fact that the light breeds hatched early in the season will break into a partial moult during the first three months of next year should not deter anyone from hatching at least a proportion early, because what is lost in eggs when the moult commences is made up by the extra price obtained for the early-hatched cockerels, and by the eggs which are laid before the moult. Moreover, the birds after moulting and having had a spell make good breeders at this time of the year.

The Brooding Plant.

If the brooders have not already been thoroughly cleaned up and disinfected this should be done without delay so that everything will be in a proper sanitary condition before the chickens arrive. Even though, as should have been the case, the equipment was cleaned up after the last season's chicks were taken out, another clean-up and disinfecting are desirable before using. Any of the good commercial disinfectants may be used, but cleaning must precede spraying to be most effective. Any necessary renovations of the brooders or the heating system should also be attended to, so that everything is in perfect working order to receive the chickens.

Working the Brooder.

Some of the main factors in the successful brooding of chickens can be stated in a few words. In the first place it is essential to have a brooder large enough to accommodate the number of chickens it is desired to handle, and this should be based not upon the accommodation for day-old chicks, but allowance must be made for the increase in growth during the time they are in the brooders, which is usually six weeks. This means that a brooder which will accommodate, say, one hundred chickens at a day old would only be large enough for about fifty by the time they were six weeks old.

The next consideration is the method of heating, and it is most important that the heater be capable of generating sufficient heat to allow of the admittance of ample ventilation and yet ensure a temperature which will prevent packing together. Upon these factors mainly depends the successful rearing of chicks. It is necessary to be able to maintain a temperature of at least 90 deg. Fahr. in the coldest of weather for the baby chickens.

The temperature should then be reduced at the rate of 3 to 4 degrees a week, so that by the end of six weeks the chickens may be weaned off the heat altogether.

A leaflet giving full particulars with regard to feeding chickens from the day-old to the adult stage is available from the Department gratis.

Experiments in Feeding Mineral Mixtures.

During my tour abroad I visited the Hillsborough Experiment Station at Belfast and there saw a number of groups of young stock which had been reared on a ration to which had been added from one up to the whole of the various ingredients of a mineral mixture. The idea was to ascertain which ingredients were beneficial in such a mixture. In view of the interest which has been taken in feeding mineral mixtures to poultry, I arranged for particulars of the results when published to be supplied to me and these have just come to hand. Similar experiments were also carried out at the Rowett Research Institute, Aberdeen, Scotland. It is explained that these experiments have only been carried out for one year and that final conclusions cannot be drawn from the results, but it is intended that further experiments both on growth and laying shall be carried out at different centres during the next two or three years. The following particulars of the experiment are given in an article (reprinted from the *Scottish Journal of Agriculture*) under the authorship of G. Scott Robertson, D.Sc., J. B. Orr, M.A., M.D., D.Sc., J. H. Prentice, B.Sc., and A. J. MacDonald, B.Sc., B.Sc. (Agr.):—

Groups of closely related chicks were housed under the same conditions and fed upon the same basal ration. To the ration of one of the groups there was added a "complete" mineral mixture known to improve the basal ration. In the case of each of the other groups, one or more of the ingredients were omitted. The rate of growth and health of the birds in these groups, compared with the group getting the complete mixture, showed whether the omissions affected the nutritive value of the ration.

The Aberdeen Experiments.

Six groups each of seventy-eight white Leghorn chicks were used. For the first nine weeks the chicks were allowed out on runs in which there was almost no grass. They were then transferred to houses with runs rich in clover. In each case the runs occupied by the different groups were the same, so that whatever was obtained from the pasture by one group was obtained by all the groups.

The basal ration consisted of:—

Bran	4 parts.
Sharps	2 "
Maize	2 "
Ground oats	1 "
Soya bean meal	1.5 "

The complete mineral mixture was one found in experiments in Belfast to accelerate the growth of chickens when added to a basal ration such a the above. Its composition was as follows:—

Steamed bone flour	40 parts.
Sodium chloride	6 „
Potassium chloride	8 „
Potassium iodide	0.04 part.
Ferric oxide	0.4 „
Sulphur	1 „

The complete mixture was fed to the first group at the rate of 4 per cent. of the ration. The mixture was then altered by omitting for one group sulphur, for the next sulphur and ferric oxide, and so on, omitting one more in each case until the sixth group received only steamed bone flour. The following table shows the results obtained:—

Mixture fed in different groups.	(1) Bone Meal Salt. Pot. Chl. Iodine. Iron. Sulphur	(2) Bone Meal Salt. Pot. Chl. Iodine. Iron.	(3) Bone Meal Salt. Pot Chl. Iodine.	(4) Bone Meal Salt Pot. Chl.	(5) Bone Meal Salt	(6) Bone Meal
Weight*— Av. gain, gms.						
9 weeks	498	545	545	566	632	423
15 weeks	1,020	1,076	1,039	1,045	1,155	982
Mortality*%—						
1st 6 weeks	10·3	12·8	11·5	6·4	7·7	12·8
Pullets only	2·5	Nil.	Nil	11·8	Nil	20·0
Egg-Laying— Time to 1st egg—						
Days	125	.†	131	133	125	159
Av. No. of eggs per pullet at—						
22 weeks	5·6	...	5·4	7·1	7·0	1·7
26 weeks	20·0	. .	20·6	19·7	21·9	12·8
Food consumed per lb. live weight increase in 15 weeks— lb.	6·3	6·5	5·1	5·6	5·3	7·4

* After 6 weeks pullets and cockerels were separated. From that time results refer to pullets only

† Group 2 was abandoned at the end of the growth period owing to lack of accommodation for other experimental work.

Growth.—The experiment falls naturally into two parts. At the end of the first nine weeks, during which the supply of grass was very small, the first five groups, all receiving salt, were roughly comparable as regards gain in weight. The sixth group, without salt, made much smaller gains, the average being 423 gms. as compared with an average of 557 in the other groups, a difference of 24 per cent.

The sixth group, without salt, was also very much inferior in general condition. During the first six weeks there was no outstanding difference in percentage mortality between salt and no-salt groups, but, after separation of the pullets, mortality was higher in the no-salt group, totalling 20 per cent. to the end of the growth period, as compared with 11.8 in Group 4, 2.5 in Group 1, and none in the other groups.

Many of the deaths in Group 6 occurred under almost identical conditions. The birds looked listless and ill, with drooping wings and combs which gradually became black and shrunken. Post-mortem examination showed no signs of disease, but the intestines of dead birds usually contained a black mass of undigested material.

During the next six weeks, when the birds were on runs with grass rich in clover, the gains in weight of all the groups were similar. The average gain in the no-salt group was 559 gms., as compared with an average of 510 in the other groups. Birds that were in very poor condition at the end of the first period rapidly recovered on grass, but the general condition of the no-salt group did not reach the level of the other groups.

Egg laying.—Egg laying commenced in the salt groups at from 125 to 134 days, as against 159 in the no-salt group. The number of eggs laid in the no-salt group to the end of the 22nd week was less than in the other groups, 1.7 on an average as against 6.3 per pullet in the other groups, but when they had been continued for a further period of four weeks on grass there was no significant difference between the records.

From these results it appears that, while any or all of the five elements omitted from the mineral mixture, except salt, can be left out without greatly affecting the gain in weight or health of the birds, the omission of salt results in a low rate of growth with impaired health and relatively high mortality. Food consumption per unit increase in weight is increased.

The Belfast Experiments.

Four groups of white Wyandotte chicks, housed under similar conditions, were fed on a cereal ration supplemented with soya bean meal and a mineral mixture as described above. Group 1 received the complete mixture and one or more of the constituents were omitted from the feed of the other groups. The following table gives the results:—

Mineral mixture fed to different groups.	(1) All ingredients.	(2) Steamed bone flour omitted.	(3) Iron, sulphur and iodine omitted.	(4) Salt and potassium chloride omitted.
Av. gain in gms. in 103 days	1,479	1,458	1,450	756
Av. gain in 103 days—Cockerels	1,617	1,565	1,633	Sexes not distinguishable with certainty.
Av. gain in 103 days—Pullets	1,326	1,314	1,252	
Av. gain in 119 days ... (Pullets except in 4)	1,495	1,289	1,493	940 (both sexes)
Mortality over 103 days ...	18·8%	10·2%	15%	49·5%
Lb. food per lb. live weight increase	5·05	4·7	5·2	9·3

Growth.—In this experiment the omission of iron, sulphur and iodine seemed to have little effect on the nutritive value of the ration. The omission of steamed bone flour seems to have had some effect in the later stages of growth, *i.e.*, between the 103rd and the 119th day. The omission of chlorides (sodium and potassium) had a very marked effect. The rate of growth during the first 103 days was little more than half that in the other groups, while the mortality was trebled and the food consumption per lb. of increase almost doubled.

Laying.—The following table shows the results of the laying trials, which continued from August, 1929, to April, 1930:—

Mixture fed.		Eggs per bird.
Complete mixture	.. ..	132.9
Do	less iron and sulphur ..	128.9
Do	less iodine	135.9
Do	less salt and potassium chloride	91.7

The same effect is again evident. Omission of iron, sulphur and iodine had no effect on egg yield. Omission of salt and potassium chloride caused a considerable reduction in the number of eggs.

Sixty per cent of our Food is Derived from Grasses.

It has been claimed by a certain authority on agriculture that if all the plants in the world were destroyed and the grasses alone remained, man would still be able to exist. When it is realised (writes E. P. Phillips in *South African Grasses*) that probably 60 per cent. of the total diet of the whole of the 1,700 millions of human beings in the world comes from the grass family, the above statement is not so far fetched.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1931.

Forbes Sheep Show (E. A. Austen)	July	15, 16
Cootamundra Sheep Show (G. B. Black)	„	21, 22
Young Sheep Show (Thos. A. Tester)	„	29, 30
Peak Hill (W. Crush)	Aug.	18, 19
Lake Cargelligo (C. W. Hutchens)	„	18, 19
Gilgandra	„	18, 19
Illabo (J. McCarthy)	„	19
Condobolin (J. M. Cooney) ...	„	25, 26
Grenfell (J. M. McInnes) ...	„	25, 26
Ungarie (D. R. Bedford) ...	„	26
Wagga (F. H. Croaker)	„	25, 26, 27
West Wyalong (A. Andrew) ...	Sept.	1, 2
Murrumburrah (W. Worner) ...	„	1, 2
Parkes (L. S. Seaborn)... ...	„	1, 2
Burrowa (S. G. Hughston) ...	„	3, 4
Barmedman (S. S. Penberthy)	Sept,	5
Young (Thos. A. Tester) ...	„	8, 9
Forbes (E. A. Austen)	„	8, 9
Cowra (E. P. Todhunter) ...	„	15, 16
Temora (J. M. McInnes) ...	„	15, 16
Junee (G. W. Scrivener) ...	„	22, 23
Canowindra (W. E. Frost) ...	„	22, 23
Barellan (W. H. McRae) ...	„	23
Ardlethan (Les Smith)	„	30
Berrigan (R. Wardrop)	„	30
Hay (G. C. McCracken)	Sept.	30, Oct. 1
Narrandera (J. D. Newth) ...	Oct.	6, 7
Ariah Park (Mort Collings) ...	„	7
Quandialla (Stuart Tomkins) ...	„	7
Griffith (M. E. Sellin)	„	13, 14
Bribbaree (J. Aston)	„	14
Cootamundra (G. B. Black) ...	„	20, 21

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Department of Education, Gosford Farm Homes	30	3 June, 1931
Grafton Experiment Farm (Ayrshires)	180	5 ,, 1931
F. O. Kershaw, Macquarie House, Macquarie Fields	71	5 ,, 1931
P. Ubrihien, Corridgeree, Bega	114	6 ,, 1931
Department of Education, Hurlstone Agricultural High School	45	10 ,, 1931
William Thompson, Masonic School, Baulkham Hills	48	13 ,, 1931
Gladesville Mental Hospital	42	25 ,, 1931
Navua Ltd., Grose Wold, via Richmond (Jerseys)	18	29 ,, 1931
J. F. Dowe, "Woolomol," Tamworth	48	19 July, 1931
A. L. Logue, Thornbro, Muswellbrook	40	23 ,, 1931
A. H. Webb, Quarry-road, Ryde	6	26 ,, 1931
A. Shaw, Barrington (Milking Shorthorns)	122	9 Aug., 1931
E. P. Perry, Nundorah, Parkville (Guernseys)	22	13 ,, 1931
Wagga Experiment Farm (Jerseys)	55	14 ,, 1931
Sacred Heart Convent, Bowral	12	20 ,, 1931
St. Patrick's College, Goulburn	8	22 ,, 1931
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	46	22 ,, 1931
James McCormack, Tumut	111	29 ,, 1931
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	81	12 Sept., 1931
S. L. Wills, Greendale Dairy, Cowra	37	19 ,, 1931
Wolaroi College, Orange	10	4 Oct., 1931
Riverstone Meat Co., Riverstone Meat Works, Riverstone	104	11 ,, 1931
E. S. Cameron, Big Plain, Narrandera...	28	14 ,, 1931
J. L. W. Barton, Wallerawang	17	17 ,, 1931
Newington State Hospital and Home	108	24 ,, 1931
J. F. Chaffey, Glen Innes (Ayrshires)	75	4 Nov., 1931
Lunacy Department, Callan Park Mental Hospital	29	13 ,, 1931
J. Davies, Puen Buen, Scone (Jerseys)	85	14 ,, 1931
Wollongbar Experiment Farm, Lismore (Guernseys)	129	21 ,, 1931
Tamworth District Hospital	7	24 ,, 1931
Department of Education, Brush Farm, Eastwood	6	9 Dec., 1931
Bathurst Experiment Farm (Jerseys)	21	16 ,, 1931
H. A. Corderoy, Wyuna Park, Comboyne (Guernseys)	59	8 Jan., 1932
New England Girls' Grammar School, Armidale	29	10 ,, 1932
C. J. Parbery, Allawah, Bega	119	10 ,, 1932
New England Experiment Farm, Glen Innes (Ayrshires)	37	12 ,, 1932
W. Spindler, Mt. Pleasant, Bega	66	15 ,, 1932
D. T. Herbert	68	18 ,, 1932
R. C. Dickson, Elwaton, Castle Hill (Jerseys)	17	20 ,, 1932
Lunacy Department, Morisset Mental Hospital	22	23 ,, 1932
Lidcombe State Hospital and Home	146	11 Feb., 1932
Riverina Welfare Farm, Yanco	77	25 ,, 1932
Department of Education, Yanco Agricultural High School	33	26 ,, 1932
W. M. McLean, Five Islands Rd., Unanderra...	78	27 ,, 1932
Mittagong Farm Homes	46	3 Mar., 1932
George Rose, Aylmerton	4	4 ,, 1932
Kinross Bros., Minnamurra, Inverell (Guernseys)	66	5 ,, 1932
P.M. Burtenshaw, Killean, Inverell	50	5 ,, 1932
Miss Brennan. Arrankamp, Bowral	10	6 ,, 1932
Kyong School, Moss Vale	4	12 ,, 1932
G. A. Parish, Jerseyland, Berry	128	13 ,, 1932
Lunacy Department, Parramatta Mental Hospital	33	16 ,, 1932
Cowra Experiment Farm	32	24 ,, 1932
Hawkesbury Agricultural College (Jerseys)	115	15 ,, 1932
Russell Lamrock, Orange	4	26 ,, 1932
St. Joseph's Convent, Reynold-street, Goulburn	3	26 ,, 1932
St. John's Boys Orphanage, Goulburn	9	26 ,, 1932
Marion Hill Convent of Mercy, Goulburn	9	26 ,, 1932
Lunacy Department, Kenmore Mental Hospital	79	27 ,, 1932
St. Joseph's Girls' Orphanage, Kenmore	9	27 ,, 1932
J. P. McQuillan, Bethungra Hotel, Bethungra	14	1 April, 1932
St. Michael's Novitiate, Goulburn	5	26 ,, 1932
James Wilkins, Jerseyville, Muswellbrook	89	28 ,, 1932
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	195	29 ,, 1932
Tudor House School, Moss Vale...	8	3 May, 1932
Australian Missionary College, Cooranbong	58	6 ,, 1932

—MAX HENRY, Chief Veterinary Surgeon.

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1*st July,* 1931.

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VOL. XLII. PART 7. JULY 1, 1931.

Agricultural Gazette of New South Wales.

How Science Aids in Improving Milk Supplies.

L. T. MACINNES, Director of Dairying.

RECENTLY two striking illustrations have occurred of the work which the field instructional staff of the Dairy Branch, Department of Agriculture, is continuously carrying on throughout the dairying districts of the State in regard to uplifting the quality of the milk and cream produced on dairies registered under the Dairies Supervision Act, now administered by the Department of Agriculture. The investigations referred to were carried out by Mr. Senior Dairy Instructor A. T. R. Brown, who is in charge of the Illawarra and Southern Tablelands District, with headquarters at Nowra.

The value of this work may be nullified, however, if any of the receiving, treating and distributing depots with their respective plants and surroundings, with which the milk subsequently makes contact, are not maintained in a sanitary condition. The present position of the metropolitan milk supply area is unsatisfactory in this regard. Some ten years ago it was found on investigation that the butter manufacturing section of the dairying industry suffered from similar conditions. As the factories were brought up to and operated at the required official standards an immediate uplift in the quality of the butter placed on the market was brought about, and this has been not only maintained but improved upon in subsequent years.

Defective Milk Cans.

The first case to be investigated concerns a well-known Illawarra dairyman supplying milk to Sydney through the local receiving depot.

The milk produced on the farm came under review and this resulted in the Senior Instructor personally carrying out tests to ascertain the relation of its contact with the defective metal of old cans to quality deterioration. The reductase test was applied to the contents of four new and two old and slightly damaged milk cans. The milk from the new cans went five hours before reacting, while that of the old cans reacted in two and a half hours, showing that the former was first-grade while the latter was below standard. A sample of a mixture of the contents of the old and new cans took four hours to react, showing the adverse effect of the larger and better portion coming in contact with the contaminating influence arising from the damaged containers.

The owner replaced the old cans with new ones immediately he became aware that their adverse effect on the quality of the milk was nullifying all the usual care he gave to the dairy operations in regard to cleanliness and the use of boiling water to wash the utensils.

The Cow as a Carrier of Infection.

The second investigation arose from the milk and cream delivered to the Nowra Co-operative Dairy Co. by Mr. H. Caines, of Brundee, being graded out as inferior during the month of February.

Mr. Caines tried by every means within his knowledge to effect a remedy, but could make no improvement. The Department's aid was sought. As the condition of the dairy premises, utensils and cans, and the method used by Mr. Caines demonstrated the exercise of scrupulous cleanliness, Mr. Brown in this instance directed his attention to the dairy herd itself. As each cow was milked a sample of its milk was taken and submitted to the reductase incubation and fermentation test. This work was carried out over three days, 6th, 7th and 8th March—the enthusiasm of the investigator causing him to persevere throughout Friday and Saturday to midnight on each day and to midday on Sunday.

A second test was applied to each can of milk as filled, a record being kept of the identity of the cows whose milk was put into each can. For this the cows were milked as usual by machines; for the first test the cows were milked by hand.

The result of the first test showed that only one cow's milk was deficient—it reacted in two hours. The result of the second test showed that only one can of milk was of inferior quality—it reacted in two and a half hours, whilst in both tests the milk of the balance of the herd (forty-eight cows) took eight hours to react.

The foregoing tests were made on the first day, Friday. On the following day the milk causing the trouble was purposely kept apart and the milking machines were used on the rest of the herd. Samples of the mixed bulk milk so obtained on being tested took seven hours to react and revealed a solid (non-gaseous) clot in the test tube. Sunday was given to repeating the Saturday test, with the same result.

On Thursday, 12th March, Mr. Brown applied the reductase test to a portion of the Nowra Co-operative Dairy Company's Bomaderry depot supply milk for the metropolitan area, comprising the deliveries from over sixty dairies, including that of Mr. Caines. Samples from each of the four cans delivered by Mr. Caines were tested separately. This dairy is situated some miles from Bomaderry, and its milk reached the depot at 10.30 a.m. The samples of each can and that of the bulk supply were put in the test tubes at 10.35 a.m., and all held their colour (blue) until 3.30 p.m.—five hours from commencement of incubation. The incubator was kept going overnight for the fermentation test, and when the samples were examined next morning (Friday) the curd of each can's sample, as well as that of the bulk sample, showed a solid clot free from sliminess, gas or other form of disintegration.

It has been ascertained from Mr. Caines that the cow which caused him all the loss and trouble had mammitis on her previous calving, but had come in or her last calf apparently fully recovered. She was dried off and sold for butchering within a few days of being identified as the cause of the trouble, otherwise she could have been tested for mammitis infection to verify the suspicion that this was the root cause of the inferior quality milk. Mr. Caines first suspected the milking machines, but as the trouble continued with hand milking this idea was abandoned.

The knowledge imparted by these two cases as to how milk may become contaminated should be of great interest and benefit to dairymen generally, including those in towns and suburbs. The instances also clearly demonstrate the value of efficient practical and scientific field work to the dairying industry, and indicate how keen the country dairy-farmers are as a rule to improve the quality of the milk and cream on their dairies.

"SOUTH AFRICAN GRASSES."

Two factors make E. P. Phillips' "South African Grasses" (just published by the Central News Agency Ltd., South Africa) interesting from the point of view of the Australian reader; the first is that pasture improvement is such a live question at present that anything new on the subject of grasses is welcomed, and the second reason is that some of our most promising introduced grasses (Rhodes and Kikuyu, for example, and also a large number of species more recently introduced by the Agrostologist, such as Woolly Finger, Antelope and Rhodesian Blue grasses) have come from South Africa, which suggests there may still be others even more valuable than the ones we already have. If that is so, this comprehensive work of E. P. Phillips should tell us. It contains 224 pages of text with 121 plates and figures, and although primarily a work of reference for the systematic botanist, it contains much that has a parallel in the study of grasses in this country.

The book contains chapters on the migration and distribution of grasses, the tropical, sub-tropical and temperate elements in the South African grass flora, an ecological study of the grass veld and the cultivation of grasses, the common names of grasses, grasses and human food, the grass tribes, a key to the South African genera, and detailed descriptions and illustrations of the genera.

Our copy from the publishers.

BLUESTONE AND MUSTARD DRENCH IS CHEAPEST AND BEST.

ALL the investigational work done on the drenching of sheep for worms has not shown any drench to be superior to copper sulphate (bluestone) and mustard. Moreover, it is the safest drench to use. Couple those two points with the fact that it is by far the cheapest drench, and it is difficult to imagine any reason why farmers should look further than bluestone and mustard when treating their sheep.

The comparative costs of different drenches work out somewhat as follows:—Copper sulphate and mustard one-sixteenth of a penny per sheep, carbon tetrachloride in 10 c.c. doses one-third of a penny per sheep, while a proprietary drench costs two-fifths of a penny per sheep.

Starter for Cheddar Cheese-making.

ITS PREPARATION AND CONTROL.

[Continued from page 492.]

H. H. RANDELL, Assistant Bacteriologist, and A. B. SHELTON, Senior Dairy Instructor.

Characteristics of a Good Starter.

THE value of a starter is indicated by the progressive development of the lactic acid bacteria until coagulation. The principal factor which determines the rate of coagulation is temperature, and other factors causing variation are weakened vitality of the organisms and abnormality of the milk medium used. A good starter should have the following characteristics:—(1) Mild and clean acid aroma and flavour, free from acidic or malty flavour; (2) firm, unbroken coagulum without gas pockets; (3) smooth oily texture on agitation of coagulum, free from curdy lumps.

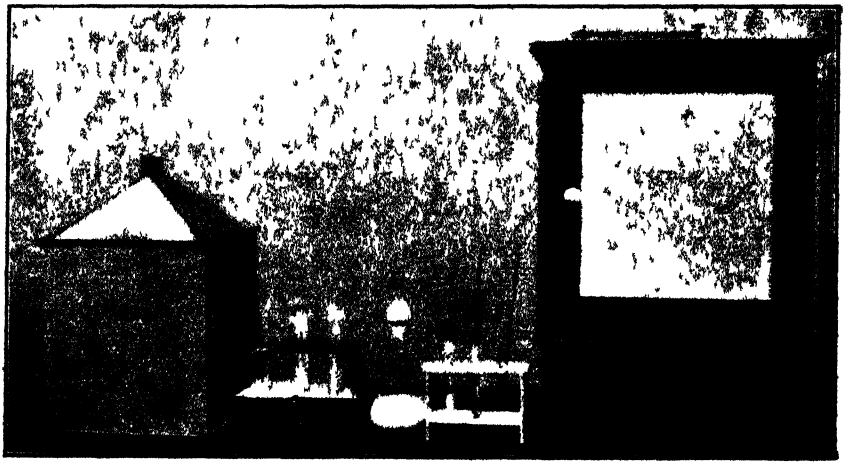

Fig. 1.—Appliances used in the Preparation of "Culture" and "Mother Starter."
Left, Steam steriliser. Right, Incubator.

Control of Starter at the Factory.

In controlling cheddar cheese starter at the factory by the method here described, three distinct stages of preparation are necessary. The terms used to signify these stages are:—(a) Culture; (2) mother starter; and (3) bulk starter. If care is taken in the routine of preparation, a culture of a selected strain of lactic acid bacteria can be carried on in a pure condition for long periods, and from it an easily-controlled quantity of mother starter can be prepared, which, in turn is available for inoculation of bulk starter each day.

In order to obtain constant results, and in order to make available sufficient starter for use in the cheese vat each day, it is necessary to adopt the following precautions:—

1. Use fresh clean milk. It is advisable to select the milk, as lactic acid bacteria do not thrive well in all kinds of milk.

2. Propagate test tube cultures in sterile milk. Avoid contamination during handling or when making transfers.

3. Inoculate cultures and starters when the temperature of the milk is about 75 deg. Fahr.

4. Regulate the amount of added inoculum (coagulated milk) to produce the desired coagulation and acidity in the bulk starter just prior to use.

5. Propagate and use cultures and starters when acidity is about 0.65 to 0.75 per cent.

6. Avoid development of more acid than 0.75 per cent. before use. Amounts in excess of this are toxic to the lactic acid bacteria.

7. Maintain cultures and starters at a temperature of 70 to 75 deg. Fahr. during incubation.

The Apparatus Required.

The apparatus listed below was designed for routine use in a factory handling up to 1,000 gallons of milk daily, and includes extra glassware in case of breakages, and duplicate starter cans to facilitate cleansing:—

24 Rimless test tubes (6 inches x ¾-inch).
6 Pyrex Erlenmeyer flasks, each 1 litre capacity.
2 Pipettes 10 c.c. for filling test tubes.
2 Glass funnels (5-inch diameter) for filling flasks.
1 Seamless metal or enamel jug with fluid ounce graduations, for measuring milk into flasks and measuring mother starter.
2 Pipettes (2 c.c.) graduated to tenths of 1 c.c. for measuring culture into flasks.
1 Platinum wire loop, set in metal holder, for transferring culture. Nicrome wire (23 gauge) may be used for this purpose and is very much cheaper than platinum wire. Diameter of loop 3/16-inch.
1 Small methylated spirit lamp.
2 lb. of cotton wool for plugging tubes and flasks.
1 Metal rack or wire basket to hold test tubes in the steam steriliser.
1 Wooden test tube rack to hold tubes in the incubator.
1 Seamless metal dipper (1 or 2 gallons) to measure bulk starter.
1 Steam steriliser (14 inches x 14 inches x 14 inches) with pyramid-shaped lid, so fitted with a perforated steam pipe at the base that it can be easily connected to the ordinary steam service at the factory.
1 Automatic temperature control incubator designed to accommodate cultures, mother starters and bulk starters.
4 Shot-gun type starter cans with lid and stirrers. Each can to hold 8 gallons.
1 Heating and cooling tank to hold 2 starter cans. Single units are available.

In the list of requirements should be mentioned a starter room or a room set apart in the factory for the special purpose of handling starters. A room 10 feet by 12 feet is a convenient size. It should be clean, well lighted and accessible, with a southerly aspect, or so situated in the factory that it will not be influenced by the heat of the sun during the day.

The Technique of Propagation.

To prepare "culture," place about 10 c.c. of fresh milk in a clean test tube by means of a pipette, and insert a cotton wool plug in the opening of the tube. The plug should be inserted to a depth of about 1 inch, but not too tightly. Place the tube of milk in the wire rack (used for the purpose) in position marked No. 1 (Fig. 2) and heat in steam steriliser for 20 to 30 minutes, then withdraw to cool. On the following day move the once-heated tube in No 1 position to No. 2 position (Fig. 2), and prepare another tube of milk in a similar way and place it in No. 1 position, heat in steamer and cool as before. On the third day move No. 2 tube to No. 3 position, No. 1 to No. 2 position, and prepare another tube of milk and place in No. 1 position, and again heat in steamer for 20 minutes.

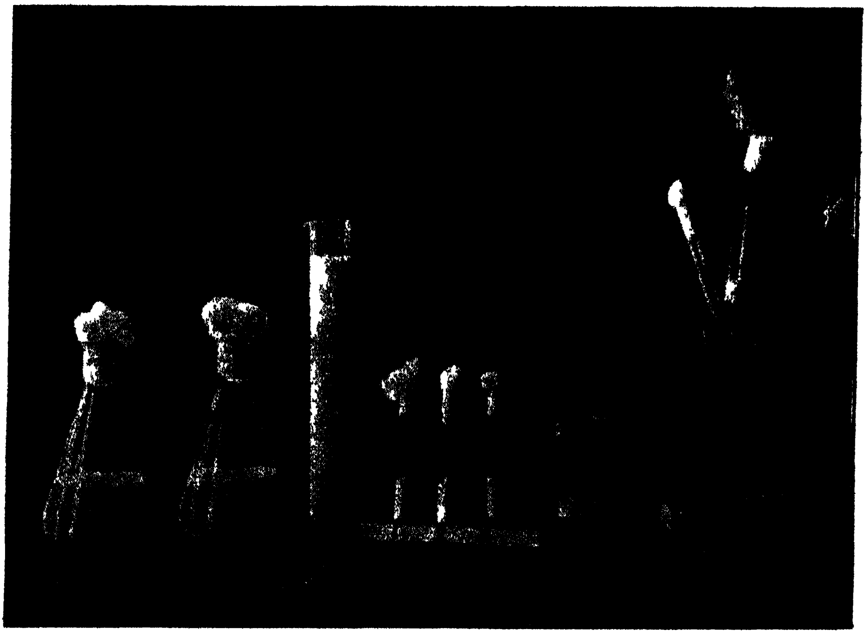

Fig. 2.—Transferring Starter Culture to a Tube of Sterile Milk.

In this way the tube of milk in No. 3 position has been heated for 20 to 30 minutes on each of three consecutive days, and is now considered to be sterile and ready for inoculation with commercial lactic ferment or the culture supplied by the Department of Agriculture.

To inoculate the tube of sterilised milk from an agar slope culture as supplied by the Department of Agriculture, sterilise the platinum or nicrome wire loop by heating to redness in the flame of a methylated spirit lamp, then holding the two tubes (sterile milk and agar slope culture) in the left hand in such a way that the plug of the agar culture tube can be removed by gripping it with the little finger of the right hand, still holding the sterilised wire loop between the forefingers and thumb of the same hand, carefully draw the loop (now cool) over the surface of the agar slope, and remove portion of the culture of lactic acid bacteria. Replace the plug in the agar culture tube and inoculate the tube of sterile milk. Place the tube of inoculated milk in the incubator at 70 to 75 deg. Fahr. until coagulation occurs (about twenty-four hours).

Having obtained a pure culture of lactic acid bacteria in milk, the subsequent daily procedure of continuing the propagation of culture is to inoculate the tube of sterile milk from No. 3 position, using the platinum loop, with the coagulated milk inoculated on the previous day. One loop full of coagulated milk is sufficient for the inoculation. If diameter of the loop is 3-16 inch it will deliver approximately $\frac{1}{100}$ c.c. of curdled milk. While a sufficient number of tubes of sterile milk may be prepared at one time to meet the requirements for a week or more, it is advisable under factory conditions of working to prepare each day only duplicate tubes of sterile milk for the propagation of culture. If this is done, the danger of recontamination or other spoilage of the culture medium will be minimised, and a culture of reliable purity will be regularly available for inoculation of mother starter, which is carried on simultaneously.

To Prepare Mother Starter.

Place about 1 pint of fresh milk in a clean Erlenmeyer flask, using a glass funnel to avoid wetting the neck of the flask. Insert a plug of cotton wool and heat in the steam steriliser for twenty to thirty minutes. Only one cooking is required for mother starter milk. The milk in the flask must be cooled to 70 to 75 deg. Fahr. before inoculation. Cooling is hastened by allowing cold running water from a tap to flow over the flask. To do this, grip the neck of the flask and gently rotate it under the flowing water. Avoid wetting the cotton plug with water or with the milk during cooling. Inoculate the pint of cooled milk in the flask with 0.5 c.c. of culture prepared on the previous day, using a sterilised 1 or 2 c.c. straight-sided pipette. Place the flask of inoculated milk in the incubator at 70 to 75 deg. Fahr. until coagulated on the following day, when it can be used to inoculate the bulk starter.

To Prepare Bulk Starter.

Place a calculated amount of fresh milk in a starter can, heat in the bulk starter heating and cooling tank for about one hour at 180 to 190 deg. Fahr., and then, after allowing the hot water to run out of the heating tank, cool by circulating cold water round the can. Stir the milk in the can frequently during cooling. When the milk has been cooled to about 75 deg. Fahr. it is ready for inoculation with mother starter prepared on the previous day. The amount required will be approximately three-quarters of one fluid ounce per gallon of bulk starter milk, or ½ per cent. Inoculation at this rate will cause coagulation of the milk in sixteen to seventeen hours if kept at 70 to 75 deg. Fahr during the incubation period.

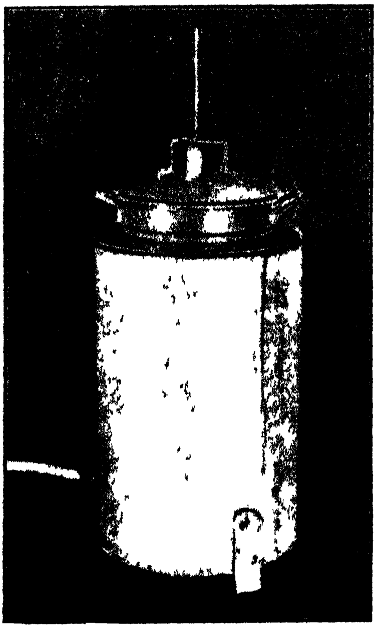

Fig. 3.—Bulk Starter Preparation Outfit (Single Can Type).

In manufacturing cheddar cheese from pasteurised milk, numerous trials, using vigorous bulk starter, have shown that 1¼ per cent. of inoculum will give satisfactory control in the cheese process. The amount of bulk starter required each day will vary according to the amount of milk received at the factory for manufacture into cheese. In the case of a factory receiving 500 gallons of milk daily, approximately 6¼ gallons of bulk starter is necessary. This amount may be prepared in a single can heating and cooling outfit (capacity of can, 8 gallons). For a supply of 1,000 gallons of milk, a 2-can bulk starter preparing outfit would be required, or as an alternative two single units may be used. A factory receiving 2,000 gallons of milk daily would require to duplicate the above equipment in order to provide 25 gallons of bulk starter. Larger quantities of bulk starter would be preferably prepared in a small batch pasteurising and cooling vat.

OVERCOME THE DEPRESSION BY INCREASED EFFICIENCY.

IF the present trouble is due to over-production, the charge that extension work and scientific research are to blame may have a grain of truth in it, writes Prof. G. F. Warren, in *Scientific Agriculture,* the official organ of the Canadian Society of Technical Agriculturists. But if the trouble is monetary, and if we must learn to produce at a profit with prices at pre-war levels, and wages far above pre-war, then there was never before a time when research and education should be pushed with more vigour. Farmers must know how to adjust and act quickly.

Scientific research, agricultural extension teaching, the use of improved machinery, greater output per man, are not the causes of the depression, but are the major ways in which the depression can be met. The farmer, the manufacturer, or the country that cannot increase efficiency quickly will be left behind.

Fallowing Competitions, 1930-31.

JUDGES' COMMENTS FROM VARIOUS DISTRICTS.

South-western District.

D V. DUNLOP, H D.A., Agricultural Instructor.

THE Young, Murrumburrah, and Barellan Agricultural Associations and the Tullibigeal Branch of the Agricultural Bureau conducted competitions. Both the number of societies and the total number of entries judged (fifty-five) were less than in the previous year. Damage done to the fallows by the very wet autumn was mainly responsible for the falling off.

The Season.

The rainfall recorded at the various centres was as follows:—

	Young.	Murrumburrah.	Barellan.	Tullibigeal.
1930.	Points.	Points.	Points.	Points.
July	168	132	107	138
August	203	174	187	121
September	72	75	54	21
October	360	421	326	270
November	30	91	159	28
December	200	224	300	516
1931.				
January	110	87	63	Nil.
February	72	14	37	28
March	222	277	302	127
Total	1,437	1,495	1,535	1,249

Fair to good rains during the winter months enabled practically all fallows to receive their first working during June and July, and many were given a cultivation with the springtooth or harrows following the rains of early August. Splendid rain fell in October, following a very dry September, and much of this moisture was conserved by working just before harvest. This was the first rain for many months that really penetrated the subsoil, and it laid the foundation of some well compacted and moist fallows. Exceptionally heavy rain fell during December, and some fallows were thrown out of condition, a few being badly scoured. Melon and other weed growth rapidly took possession where cultivations were not given as early as possible in the new year. The rainfall during March was the heaviest recorded during that month for some years, and it severely damaged many fallows in the Young, Murrumburrah, and Barellan districts through washing and flooding. On the other hand, it provided abundant moisture, brought about good compaction, and ensured excellent germination of crops.

The Young Competition.

Twelve entries were judged in this competition, and all were of a high standard, only nine points separating first and last.

Mr. F. Freudenstein secured 144 points for his winning entry. It was an exceptionally fine fallow, being well mulched and possessing compactness and abundant moisture, while there was an absence of weed growth. The land was ploughed early in September, scarified in October and January, harrowed, scarified and harrowed again in March.

Mr. W. R. Shannon secured second place with 143 points. This fallow possessed the best compaction in the competition. It is interesting to note that it was scarified in June instead of being ploughed.

The Murrumburrah Competition.

Due mainly to the effects of the heavy rains previously mentioned, only five entries were judged in this competition. It was won by Messrs. Bradford Bros., with 143 points. The land had been ploughed early in September and harrowed and combined in November and March. Weed growth, particularly couch grass, was present in all entries, most of which were a little out of condition.

The Barellan Competition.

This competition attracted twenty-three entries and was divided into two sections, viz., mallee and open country. Entries generally were of a high standard, but a few had not been worked after the March rain, and consequently the mulch was out of condition.

Mr. J. B. Semmler won the mallee section with 142 points, his fallow being very clean, with excellent moisture content and compaction. It was mouldboard ploughed in June, springtoothed in August, October, January, and April.

First place in the "open" went to Mr. R. A. Irvin, whose entry had the best mulch and was the cleanest in the competition. The land was ploughed in May, springtoothed in July, harrowed in August, scarified in October and February, and springtoothed in April.

The Tullibigeal Competition.

Fifteen entries were received for this competition, which was conducted by the Tullibigeal Branch of the Agricultural Bureau.

First place went to Mr. J. Wearing, with 140 points. The land was ploughed in July, springtoothed in August, October, and January.

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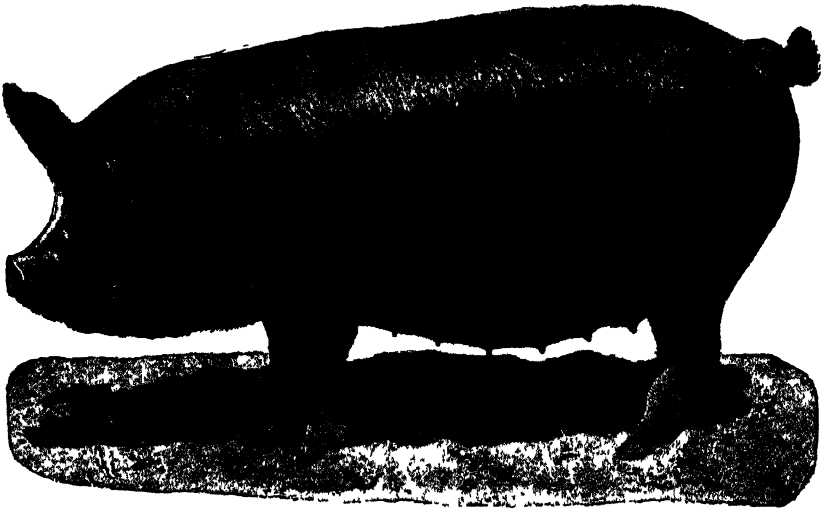

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G. D. ROSS, Under Secretary, Box 36A, G.P.O., SYDNEY.

Mr. H. J. Harley secured second place with a very fine entry, only inferior to the winner in condition and compaction. The land was ploughed in July, springtoothed in August, October, January, and March.

Judge's Comments.

The standard of the leading fallows in all competitions was particularly high. Moisture was abundant and compaction exceptionally good, due to the heavy and copious rains. No matter how land is worked, good compaction cannot be obtained without soaking rains.

The competitions emphasised the fact that timely cultivation, combined with judicious use of sheep, will keep fallows clean and in good order even in a year of abundant growth. Only one entrant had allowed melons to get so far advanced that a disc had to be used. To keep costs as low as possible it is realised generally that cultivations must be reduced to an effective minimum and sheep used to the utmost. If weeds once take possession, extra cultivations are necessary and costs mount up.

Western District (Parkes Centre).

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

Nelungaloo and Gunning Gap branches of the Agricultural Bureau were the only bodies to promote fallowing competitions in this section of the western district.

A Favourable Season.

From the point of view of fallowing the rainfall was very favourable. The good rains of June, 1930, enabled the early fallowing to be done when the soil was in an ideal condition. The October rains were also opportune for the spring cultivation, and those of January and March enabled cultivation clearly to define the consolidated sub-surface soil.

Prior to June, 1930, the soil and subsoil were in a dry condition, and the rainfall from June until the time of judging was 21.13 inches, of which 256 points were recorded on 1st April. The total fall from 30th June, 1930, until 31st March, 1931, was 18.57 inches. In some examinations made on 31st March, prior to the 256 points on 1st April, the moisture was found to be petering out in the subsoil at a depth of 21 inches. This indicated that a rainfall of 18½ inches during the fallowing period, provided the soil and subsoil were dry prior to the previous June, is insufficient to wet the subsoil thoroughly. The subsequent fall of 256 points, however, pushed the subsoil moisture downwards, and on 8th April attempts to reach the bottom of the moisture at a depth of a little more than 3 feet failed. This illustrates the large rainfall required, even when helped by efficient fallowing methods, to saturate the subsoil thoroughly when it is dried out to a depth of, say, 3 feet.

The Gunning Gap Competition.

There were thirteen competitors in this competition, and the placings were as follows:—

		Points.
1st	W. Scott, Deloraine (No. 1 entry)	146
2nd	K. B. Rawson, Lila Park	145
3rd	T. W. Dwyer, Pleasant View (No. 1 entry)	143
	R. W. G. Hodges, Harriet Vale	143

All fallows in this competition were of a very high standard. The value of early ploughing and preference for the mouldboard plough are lessons that have been well learned in this centre. Of the thirteen competing fallows not one block was ploughed later than mid-August, and in twelve cases the mouldboard plough was used.

Tine implements for the working of the soil in this particular locality have generally been recommended, and of the aggregate workings of all fallows, which numbered forty, thirty-two of these were given with the combine, two with the scarifier, two with the disc cultivator, and four with the harrows. Only in one instance was the important spring working neglected, and in most cases two were given, one in late August or September and the other in mid-October. Most of the fallows were worked three or four times, and generally as soon after rain as the moisture conditions would allow.

Results of the Nelungaloo Competition.

Only five entries were received by the Nelungaloo Agricultural Bureau for its fallow competition. The same favourable seasonal conditions prevailed in this locality as at Gunning Gap.

The placings in the Nelungaloo contest were as follows:—

		Points.
1st	E. J. Johnson, Iona, Gunningbland	141
2nd	W. G. Pilkington, Keilor	140
3rd	W. Norman, Nelungaloo	134

North-western District.

J. A. O'REILLY, H.D.A., Agricultural Instructor.

Gunnedah P. and A. Society was the only body to carry out a fallow competition. Nine entries were judged.

An Unusual Season.

The season was peculiar in so far as the usual summer rains were not generally received. The rainfall from December till the beginning of March was in the nature of spasmodic thunderstorms. A decided break occurred, however, in the early part of March, when the whole of the district participated in very beneficial rains.

Rainfall registrations at Gunnedah Post Office were as follows:—

1930.	Points.	1931.	Points.
June	613	January	114
July	143	February	35
August	53	March	410
September	81	April	254
October	344		
November	61		
December	144		

Total for short summer fallows, 813 points; total for winter fallows, 2,252 points.

Considerable thought was given the preparation of the fallow this season in view of the economic position, and also in view of the dry conditions which prevailed during the period from December till March. Short summer fallows upon which the straw was burnt as soon as the maximum amount of use had been made of it for feed, and which had been worked after the March rains, were in excellent condition for sowing. Considerable difficulty was experienced with those short summer fallows where the straw burn was delayed till after the rain, as the rapid growth of rubbish prevented a good burn, and this, together with the straw, rendered the working of the soil a difficult matter. Many short summer fallows in the district were in excellent condition at sowing time. In these cases the straw was burnt in early summer and the land worked once during March, the sowing being carried out with a cultivator drill in April.

A feature of the medium to heavier classes of soils in the north-west generally is that, given an early initial working, they remain in good natural physical condition, and with the aid of sheep on the fallow a good seed-bed is obtained with a minimum of cultivation.

The Leading Fallows.

F. Shaw, Biwondah, Emerald Hill (First Place).—This soil consists of a medium red loam and contains traces of gravel. The land was cropped with wheat last season and the straw was burnt early. The rigid tine scarifier was used for the initial working in December, 1930, and followed by harrows at end of February; the rigid scarifier was used again in March, and the harrows followed soon after. The fallow was then springtoothed about the middle of April. The result was a well compacted seedbed underlying a mulch which was in good physical condition and of uniform depth.

A. Griffiths, Hambledon, Gunnedah (Second Place).—The soils consists of a greyish self-mulching clay loam, which was sown to oats last season. The land was disc-ploughed in October, 1930, and harrowed in January, 1931; the springtooth was used in March and again in April, this time followed by the harrows. The depth of mulch and consolidation showed slight unevenness, but the general condition of the fallow was excellent. A feature of this fallow was that although the land had been sown to wheat for upwards of twenty years it showed distinct freedom from black oats.

The use of oats as a rotation grazing crop for wheat has much to recommend it in this north-western wheat area, as it gives excellent control of black oats and fungous diseases, which are the two biggest factors in decreasing crop yields.

F. Adams, Collybee, Mary's Mount, Gunnedah (Third Place).—The soil consists of a dark to chocolate self-mulching loam, and was cropped with wheat last season. The springtooth cultivator was used for the initial working in January after a good stubble burn. The fallow was harrowed in March and springtoothed in April, and was in excellent condition generally, but showed slight variation in depth of mulch.

Quandialla Fallow Competition.

T. P. TAYLOR, H.D.A., Experimentalist, Temora Experiment Farm.

The fallow competition promoted by the Quandialla P.A.H. and I. Society attracted thirteen entries.

An Excellent Season.

The season from a fallowing point of view was excellent, the good rains that fell during the late summer months making it possible to work the fallows when the land was in the right condition for the production of an excellent mulch and seed-bed. These rains also germinated the weed seeds, which were then destroyed by subsequent cultivations.

Early preparation of the fallow was the general rule, ploughing operations being completed in July and the first working with the springtooth cultivator given in the spring months. From spring till seeding time sheep were used extensively to keep the fallows clean, cultivations being given only when the mulch was destroyed by heavy rains or to prevent weeds from gaining a hold.

Methods Employed by Leading Competitors.

The winning fallow was exhibited by Mr. A. Harnett, and consisted of a self-mulching clay. This fallow was mouldboard ploughed 3 inches deep in July, scarified 3 inches in September, and again 2 inches deep in November to eradicate some melons which were just coming away. It was scarified again in April 2 inches deep. Sheep were used whenever necessary to keep the fallow clean. This fallow was of very high standard, being practically free from weed growth, possessing good compaction and excellent moisture content. The mulch was very good, but was inclined to be slightly on the fine side, which, however, is not very detrimental on this class of soil.

Second place was filled by Messrs. Brown and Eve. Their fallow was also on self-mulching clay, which was mouldboard ploughed 3 inches deep in July, springtoothed 3 inches in September and again 2 inches deep in April. The standard of this entry was very good, having a good mulch and adequate compaction and moisture content. Slight weed growth somewhat marred the excellence of the exhibit.

Third place was filled by Mr. R. Penfold. This fallow consisted of a medium clay loam which was mouldboard ploughed 3 inches deep in July, rigid-tine cultivated in September, and harrowed in April. The moisture content of this fallow was good and it possessed very little weed growth, but the mulch was not quite deep enough, and was a little too fine.

POINTS awarded in the Quandialla Competition.

Name.	Moisture.	Mulch.	Cleanliness.	Compactness.	Condition.	Total.
Maximum points	35	35	35	35	10	150
A. Harnett ...	34	32	34	34	9	143
Brown and Eve...	34	33	32	34	9	142
R. Penfold ...	34	31	34	33	9	141
H. Russell ...	33	32	34	32	8	139
P. Coelli ...	34	32	31	32	9	138
J. Mahon ...	33	31	33	33	8	138
J. Murray ...	33	30	31	32	9	135
A. Penfold ...	34	30	31	32	8	135
V. Penfold ...	34	30	31	31	9	135
W. Causer ...	34	28	29	32	8	131
L. Penfold ...	33	26	27	33	8	127
S. Fuge	33	28	29	30	7	127
G. Troy	33	26	31	30	7	127

WHEAT FIGURES FOR LAST SEASON.

The final figures for the 1930-31 wheat harvest show that the area sown for grain was 5,123,100 acres, including 232,400 acres which failed entirely, while the grain harvested amounted to 65,811,000 bushels, or an average of 12.8 bushels per acre.

The area sown for hay was 519,900 acres, including 4,800 acres which failed, and the production of hay was 670,750 tons, or an average of 1.29 tons per acre. In addition, an area of 21,600 acres was fed-off profitably, making the total area sown to wheat last season 5,664,600 acres.

"HOW TO SELECT THE LAYING HEN."

THE Orange Judd Publishing Company, New York, has kindly forwarded us a copy of Harry M. Lamon and Jos. Wm. Kinghorne's book, "How to Select the Laying Hen."

As careful culling often means the difference between success and failure, the poultry farmer cannot afford to dismiss the subject until he knows all there is to be known about it. Lamon and Kinghorne's book will give him the latest American ideas on culling, and although he might not agree with everything that is written by these authors, it should be remembered that practically all progress arises from an interchange of ideas, and especially from an interchange of differences of opinion rather than agreements on a subject.

The book contains 122 pages of large type text and is well illustrated.

Tomato Variety and Manurial Trials.

THE 1930-31 EXPERIMENTS.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

Trials in County Cumberland.

VARIETY trials with tomatoes were conducted on two holdings in County Cumberland last season, and the results are given below calculated as $\frac{1}{10}$ acre plots. The seed in both cases was planted in hot beds during May, the seedlings being thinned out and later transplanted to cold frames when 2 inches high. The seedlings were transplanted to the field during the first few days of September.

Varieties for the Liverpool District.

The soil on the property of Mr. E. H. Edwards, Green Valley, Liverpool, varies in nature, consisting in the main of heavy clay loam, which has been proved capable of producing good tomatoes.

The season was rather a late one, and little fruit was pulled before 20th November. Little trouble was experienced with disease or pests, although a few plants (not more than 2 per cent.) had to be pulled up owing to the appearance of spotted wilt.

The results were in accord with those of previous trials. The Earliana types again came out on top. A selection of Earliana (raised by Mr. A. Sorby, of Macquarie Fields) produced the most outstanding yield—over 149 half-bushel cases from the $\frac{1}{10}$ acre, valued at £81, 14s. 6d. The next most valuable variety was Feilen's Selected Earliana, which, although not the most persistent yielder, produced abundance of early fruit when the prices were high. Bathurst Pride, although placed third on the list, is not to be recommended for this class of tomato culture, as the fruit is rough and the plant totally unsuitable for staking.

Columbia did well under Liverpool conditions and warrants further trial. It is only a second-early variety, which sets small bunches that fill out well, producing good weight. The danger of growing a variety of this type lies in the possibility of a defective setting of fruit. In a second-early variety, if the first bunches fail to set, the next bunches are so long developing that the good prices of the early market are lost.

Dromore Favourite again did well on this property, though it does not show up to the same extent elsewhere. The value of this tomato lies in its excellent quality, shape, and the fact that the size and quality are maintained right up until the last bunches.

Varieties under Trial at Macquarie Fields.

These experiments (on the property of Mr. Alan Sorby, Macquarie Fields) were conducted on soil superior in fertility to that at Green Valley, and on an area with a better aspect. This grower, however, was unfortunate in experiencing plagues of Elephant beetle and a heavy hail storm just when the plants were placed in the field, and later spotted wilt made its appearance. All these agencies were responsible for reducing the yield to some extent.

The excellent soil conditions and the suitability of Mr. Sorby's situation were responsible to some extent for the second-early varieties, Bonny Best and Columbia, producing the top yields. Both these varieties produce fruit of excellent quality, and always command top market price if put on the market in an acceptable manner. Canadian, a second-early type, produced third top yield, forming large second bunches which came into the pulling stage in early December.

A Typical Bunch of Sunnybrook Earliana.
Grown by Mr. A. Sorby, Macquarie Fields.

Marglobe—A Fusarium Wilt Resistant Variety.
Photographed at Tascott in mid-November.

Mr. Sorby's own selection of Sunnybrook Earliana, which, in my opinion, is the ideal early variety for staking, only produced fourth highest yield. This was entirely due to the fact that the early bunches of fruit and flowers were destroyed by hail and Elephant beetles. It should not be necessary to emphasise the many advantages of Sunnybrook Earliana. Perhaps its only serious disadvantage lies in the fact that the first bunch usually shows some badly-shaped individual fruit. This is not due so much to a varietal characteristic as to the fact that this particular lot

YIELDS of Tomato Variety Trials, 1930–31.

Variety.	Yield.		Yield.		Yield.		Yield.		Total Yield.	Total Value.
	To Nov. 30th.	Value.	To Dec. 18th.	Value.	To Dec 30th.	Value.	January.	Value.		
Green Valley, Liverpool (Mr E. H. Edwards).										
	½ cases lb.	s. d.	½ cases lb.	s. d.	½ cases lb.	s. d.	½ cases lb.	s. d.	½ cases lb.	£ s. d.
Sunnybrook Earliana	38 12	500/6	77 0	924/–	20 20	145/10	12 20	64/2	149 4	81 14 6
Feilen's Earliana	28 20	374/10	57 18	693/–	28 22	202/5	14 10	72/1	129 22	67 2 4
Bathurst Pride	12 20	166/10	68 14	823/–	38 12	269/6	9 16	48/6	129 14	65 7 10
Dromore Favourite	9 18	131/2	53 0	636/–	51 8	359/4	27 2	135/5	140 4	63 1 11
Columbia	9 14	124/–	64 4	770/–	29 0	203/–	28 0	140/–	130 18	61 17 0
Marvana	32 2	417/1	49 17	596/6	19 6	134/9	8 0	40/–	109 1	58 18 4
Walter Richard's Early Globe ...	14 10	187/5	53 0	636/–	32 2	224/7	16 0	80/–	115 12	56 8 0
Marvellosa	9 15	124/6	41 18	501/–	35 6	246/9	12 20	64/2	99 11	46 16 5
Bonny Best	16 4	210/2	35 6	423/–	20 20	145/10	24 2	120/5	96 8	44 19 5
Marglobe	8 0	104/–	43 10	521/–	22 12	157/6	16 0	80/–	89 22	43 2 6
Macquarie Fields (A. Sorby).										
Bonny Best	26 13	345/–	34 9	412/6	56 6	393/7	....	......	117 4	57 11 1
Columbia	5 6	73/3	43 18	525/–	66 16	466/8	....	......	115 16	53 4 11
Canadia	14 14	189/7	40 14	487/–	45 16	319/8	....	......	100 20	49 16 3
Sunnybrook Earliana	20 20	270/–	32 7	387/6	47 9	331/5	....	.....	100 12	49 8 11
Dromore Favourite	15 2	196/1	34 8	412/–	48 10	339/–	....	......	97 20	49 7 1
Alacrity	21 20	283/10	31 6	375/–	46 20	327/10	....	......	99 22	48 6 8
Denesoria	3 12	45/6	39 14	475/–	63 12	444/6	....	......	106 14	47 15 0
Early Winner	25 0	325/–	32 7	387/6	33 8	233/4	....	......	90 15	47 5 10
Cooper's Cluster	15 2	196/1	31 6	375/–	49 0	343/1	....	......	95 8	45 14 2
June Pink	6 6	81/3	37 12	350/–	66 16	466/8	....	......	100 10	44 17 11
Marvana	7 6	94/3	28 4	338/–	58 20	411/10	....	......	94 6	42 4 1
Sam You	9 20	127/10	31 6	375/–	42 4	295/2	....	......	83 6	39 18 0
Marglobe	12 18	165/9	37 12	350/–	39 14	277/1	....	......	89 20	39 12 10
Best of All	5 16	78/10	33 8	400/–	39 14	277/1	....	......	78 14	37 15 11
Bathurst Pride	9 20	127/10	26 0	312/–	40 2	280/7	....	......	75 22	36 0 0
Marvellosa	7 6	94/3	26 0	312/–	39 14	277/1	....	......	72 20	34 3 4

of fruit is pollinated early in the season when the weather conditions are not always good, resulting in a faulty pollination, with small and ill-shaped fruit.

A Manurial Trial.

A manurial trial ($\frac{1}{10}$ acre) was conducted with Mr. H. Eastwood, of Tascott, on soil of a very light sandy nature, typical of a large area of the coastal district, and which is naturally deficient in humus and responds well to artificial manure. Mr. Eastwood carries out a two-year rotation with beans and tomatoes, alternately, every second summer, while each year a green manure crop is planted in the late winter and ploughed under during the early winter. The rotation is weak from a tomato-growing point of view owing to the presence of Fusarium wilt, which is carried over in the soil, but owing to the limited amount of cultivation ground on the property, this grower has no alternative.

YIELDS of Tomato Manurial Trial (Variety Marglobe).

Fertiliser.	Yield to 27th Nov.		Yield to 15th Dec		Yield to 30th Dec.		Total Yield.	
	½-bus. cases.	lb.	½-bus. cases	lb	½ bus. cases.	lb.	½-bus. cases	lb.
M22—560 lb. per acre at planting time ... ... P11—350 lb. per acre as top dressing	30	18	33	18	4	12	69	0
M22—560 lb. per acre at planting time ... ... Superphosphate—280 lb. per acre as top dressing ...	23	6	39	9	4	3	66	18
M22 - 560 lb. per acre at planting time ... ... P12 - 350 lb. per acre as top dressing	31	12	27	9	4	7	63	4
M22—560 lb. per acre at planting time ... ... P13—420 lb. per acre as top dressing	23	6	28	12	3	0	54	18
P13—740 lb. per acre in two applications	18	18	31	12	4	3	54	18
P12—652 lb. per acre in two applications	19	3	30	18	2	15	52	12
Superphosphate—560 lb. per acre in two applications ...	18	18	35	6	3	0	57	0
M22—560 lb. per acre in two applications	28	20	32	0	4	12	65	8
P11—652 lb. per acre in two applications	14	9	33	18	3	18	51	21

NOTE.—P11 mixture consists of 6 parts superphosphate and 1 part sulphate of ammonia; P12 of 6 parts superphosphate and 1 part sulphate of potash; P18 of 6 parts superphosphate, 1 part of sulphate of ammonia, and 1 part of sulphate of potash; and M22 of equal parts of superphosphate and bonedust.

In the first four plots the standard M22 fertiliser was used at planting time, and the plots treated with various mixtures later, while in the remaining plots the manure that was used at planting time was applied as a top-dressing. In the case of these latter plots the top-dressing was distributed at half the rate of the original dressing.

The results verify those previously obtained from these trials, viz., that an application of equal parts of bonedust and superphosphate applied at time of transplanting, and a top-dressing consisting of a mixture of six parts superphosphate and one part sulphate of ammonia are the best payable fertiliser mixtures to use with the early, staked tomato crop. These applications not only produced the top yield, but also produced the second heaviest pulling in the month of November, when relatively high prices were ruling. In the top-dressing section, superphosphate alone as a top-dressing produced better results than when the same amount of superphosphate was applied in combination with potash or in combination with nitrogen and potash.

In the other section of the experiment where the same fertiliser was used as an original application and a top-dressing, there were no outstanding figures. Equal parts of bonedust and superphosphate produced by far the heaviest yield of early and of total tomatoes. Growers who contemplate only making one application of fertiliser are recommended to use this mixture.

Variety Trials Outside the Metropolitan Area.

Variety trials were conducted at two centres outside the metropolitan area, the plots in each case being $\frac{1}{10}$ acre in area.

A Trial at Lake Cargelligo.

This trial was carried out in co-operation with Mr. D. McInnes, Lake Cargelligo. The seed was sown in hot fire frames during early June, and the plants were thinned out, transplanted to cold frames and placed in the field on 15th September. A dressing of 5 cwt. per acre of M22 was distributed along the drills prior to transplanting, and the crop was given a top-dressing of 2½ cwt. per acre of P11 fertiliser when the fruit was beginning to fill. Heavy irrigation was carried out approximately once per week when the warm weather set in. Very hot weather is experienced at the Lake during the summer months, resulting in enormous evaporation. Perhaps the best argument that can be presented to those who state that staked tomatoes are subject to sun-scald, is to point out the small amount of sun-scald seen in this district, which is as hot as any portion of the State. The soil in this district is of an open nature and fairly rich.

The heaviest yielding variety under test was Curlew, a local selection of the Chinese type that is fairly well known to the general grower. The particular selection under test was very robust, responded well to single-stake pruning and set early bunches of fruit. As with most of these selections, the fruit became wrinkled late in the season.

Mr. McInnes' own selection of Sunnybrook Earliana showed out to advantage, producing the heaviest yield of the first ripe fruit, which is the most desirable feature. Bonny Best, which usually does well in this district, did not come up to expectations this year. Dromore Favourite, although a good yielder, is unsuitable to the district, as the fruit grows too large and is inclined to split. Marvana again proved to be resistant to Fusarium wilt in this district, is a good yielder, but the fruit becomes too small near the top of the stakes.

The yields in this trial were very high, and would have been much higher if the whole of the small fruit that ripened in the summer months had been included in the weights. These yields illustrate just what can be done with this crop under the driest of western conditions with irrigation and proper treatment.

The Advantages of Selected Seed.—Mr. McInnes conducted a small trial to test the advantages of selected seed over the ordinary imported commercial seed. Both the selections (of Bonny Best and of Sunnybrook Earliana) tried were made by Mr. McInnes under approved methods. The figures obtained speak for themselves; in both varieties an increase in total yield of over 25 per cent. was made. Not only was the total yield increased, but the yield of earlier ripening fruit in the selected types was far heavier than in the unselected. This feature was particularly noticeable in the early variety, Earliana.

YIELDS of a Trial of Selected and Commercial Imported Seed at Lake Cargelligo.

Variety.	Yield to—						Total Yield.	
	15-12-30		30-12-30		January, 1931			
	½-bus. cases.	lb.	½-bus. cases.	lb.	½-bus. cases.	lb.	½ bus. cases.	lb.
Sunnybrook Earliana (non-selected).	10	13	47	16	40	19	99	0
Sunnybrook Earliana (selected)	38	17	44	0	36	16	124	10
Bonny Best (non-selected) ...	9	15	15	3	51	8	76	2
Bonny Best (selected)	21	13	51	8	35	7	108	4

Varieties under Trial at Cardiff.

This trial was conducted on Mr. W. T. Brown's property at Cardiff. The soil is a brown clayey loam typical of a vast area of country in the coastal districts of the State.

The outstanding feature of this trial was the heavy yields produced by Bonny Best and Walter Richards Early Globe. Bonny Best produced a yield equal to 1,390 half-bushel cases to the acre. This variety has always done well at Cardiff and can be taken as the standard variety for coastal work. The country around Cardiff is elevated and not very far from the sea. The Walter Richards Early Globe produces a very fine, round fruit of excellent quality. Its chief defect as an early, staked variety lies in it being a second-early variety.

YIELDS of Tomato Variety Trials outside the Metropolitan Area.

Variety.	Lake Cargolligo.								Cardiff.							
	Yield to—						Total Yield.		Yield to—						Total Yield.	
	15-12-30		30-12-30		Jan. 1931.				15-12-30		30-12 30		Jan.. 1931.			
	½-bus. cases.	lb.	½-bus. cases.	lb.	½-bus. cases.	lb.	½-bus. cases.	lb.	½-bus. cases.	lb.	½-bus. cases.	lb.	½-bus. cases.	lb.	½-bus. cases.	lb.
Bonny Best	21	13	51	8	35	7	108	4	8	3	33	8	101	16	138	3
Sunnybrook Earliana	38	17	44	0	36	16	124	10	......		......		......		.....	
Curlew	24	19	72	21	37	14	135	6	......		......		......		......	
Marvana	32	13	51	8	27	1	114	3	4	4	17	12	58	8	80	1
Dromore Favourite	25	5	40	19	44	0	113	5	0	20	20	0	48	8	69	4
Fellen's Earliana	26	3	32	13	35	18	98	2	0	15	17	12	45	0	63	8
Marglobe	......		......		......		......		......		12	22	75	0	87	22
Landreth's Earliest	14	5	60	0	17	10	91	15	......		......		......		......	
Early Canadian	8	17	31	15	40	8	80	16	......		......		......		......	
Walter Richard's Early Globe.	......		......		......		......		1	21	27	12	92	12	121	21
Marvellosa	......		......		......		......		......		8	8	60	0	68	8
Columbia	......		......		......		......		1	13	27	2	50	0	78	15
Repeater	18	8	36	16	29	8	84	8	......		......		.....		......	
Condine Red	15	8	29	19	25	5	70	8	.....		...		. .		....	

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with the view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected orange buds to nurserymen during the 1930 budding season, trees from which should be available for planting during the 1931 planting season:—

	Buds of Washington Navel.	Buds of Late Valencia.
T. Adamson, Ermington	**3,000**	**3,000**
W. Beck, Epping	**1,000**	**1,000**
A. T. Eyles, Rydalmere	**3,000**	**2,000**
J. de Freitas, Fairfield	**200**	**200**
R. Hughes, Ermington	**1,000**	**1,000**
L. P. Rosen and Son, Carlingford	**5,000**	**1,200**
B. E. Yarnall, Ourimbah	**100**	**100**

—C. G. SAVAGE, Director of Fruit Culture.

MORRIS

now dominates the Six-cylinder field.

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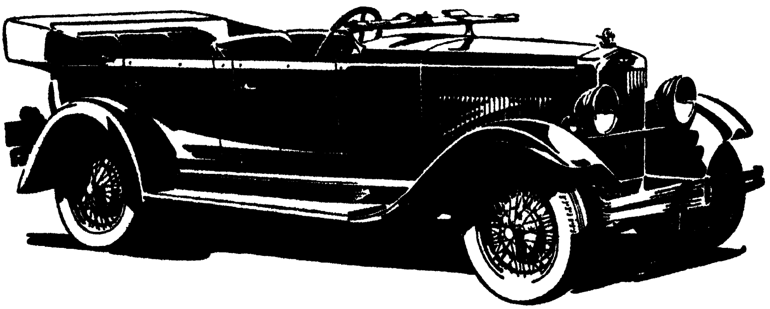

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Strain Trials with Factor Potatoes.

The Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

STRAIN trials with Factor potatoes to determine the best sources of seed supply for coastal growers were carried out last season on the farms of Messrs. J. G. Ward, Sherwood, Macleay River; E. A. Booth, Austral Eden, Macleay River; J. P. Mooney, Dumaresq Island, Manning River; and Colin Shields, Mount George, Manning River.

These trials and those of last year have clearly demonstrated the outstanding superiority of selected over unselected seed, and with the continuation of the field contests in the seed-producing areas and strain trials in the coastal areas, growers should be able to procure the very best type of seed.

On the Macleay River the season was most unfavourable. At Sherwood, only 3½ inches fell during the growing period, while late frosts and drying winds operated against high yields. At Austral Eden slightly more rain fell, but otherwise the conditions were the same as at Sherwood. At Dumaresq Island, on the Manning, although only 6 inches of rain was recorded, the season could be accounted fairly good in view of the fact that the land had been well prepared. Mount George received less rain, and, like Dumaresq Island, experienced a few late frosts and much wind.

RESULTS of Factor Strain Trials.

Strain	Sherwood.			Austral Eden			Mt George.			Dumaresq Island			Average of the Four Plots.		
	tons.	cwt.	qr.	tons.	cwt.	qr.	tons	cwt.	qr.	tons.	cwt	qr.	tons.	cwt.	qr.
W. J. McPaul's (Taralga) ...	5	7	1	7	16	0	7	15	0	10	5	3	7	16	0
O. Frost's (Bannister)	5	5	2	6	2	0	7	10	0	9	14	1	7	2	3
M. McDonald's (Crookwell) ...	5	4	2	5	2	3	5	8	0	10	5	3	6	10	0
S. Lund's (Crookwell)	3	15	3	6	18	0	5	13	0	6	5	2	5	13	1
Frost Bros.' (Bannister) ...	4	7	2	6	10	3	6	15	0	6	0	0	5	18	1
A. John's (Myrtleville)	4	2	1	5	15	3	6	4	1	6	13	3	5	14	0
D. Wright's (Taralga)	3	12	0	4	10	0	5	5	0	6	11	1	4	19	2
Unselected seed ...	2	6	1	3	10	2	3	10	0	4	11	1	3	9	2
Date sown ...	4 Aug., 1930			13 Aug., 1930			12 Aug., 1930			16 Aug., 1930					

All the samples under trial were good, with McPaul's the pick of the lot. The superiority of this strain was evident right throughout its growth. Although to all outward appearances the unselected seed was a good sample, it germinated patchily and many plants died or were stunted, due chiefly to virus diseases.

Trials at Hawkesbury Agricultural College.

From the Report of J. A. WILLIAMSON, H.D.A., Experimentalist.

The same strains as tried out on the Macleay and Manning Rivers were sown in trial plots at Hawkesbury Agricultural College, Richmond, last year. The land had been previously cropped with cowpeas for green manure, and this was turned under during May, 1930. Planting took place on 6th August, 12 cwt. of seed and 3 cwt. of superphosphate per acre being used.

The early part of the season was favourable, but dry and windy conditions later on retarded growth, while the crops were too far forward to take full advantage of the late December and early January rains, which caused a fair amount of second growth. Harvesting was carried out on 12th January, 1931.

YIELDS Based on Average Yield of Check Plots.

Strain of Factor.	Acre Yield.			
	Weight.			Percentage.
	tons.	cwt.	qr.	%
W. J. McPaul's (Taralga)	4	0	0	160
O. Frost's (Bannister)	3	19	0	158
S. Lund's (Crookwell)	3	5	2	131
A. John's (Myrtleville)	3	3	2	127
Frost Bros.' (Bannister)	3	2	2	125
M. McDonald's (Crookwell)	3	2	0	124
D. Wright's (Taralga)	2	14	0	108
Unselected seed	2	10	0	100

Virus diseases were noticed in all crops, but were most prevalent in the plot sown with unselected seed.

EXPORT OF SHEEP TO WESTERN AUSTRALIA.

THOSE who intend to export sheep to Western Australia are reminded that the animals will be thoroughly inspected at the point of entry into the western state, and should they be found to be carrying noxious weed seeds they will be quarantined until shorn or slaughtered. This precaution against the introduction of noxious weeds is provided for in the Noxious Weeds Act of Western Australia.

Mushroom Culture.

R. J. NOBLE, Ph.D., Biologist

PRACTICALLY all of the mushrooms found on the local market are those which have grown under natural field conditions, and which are collected after periods of rain during the spring, summer and autumn. Attempts have been made to produce mushrooms under commercial conditions, but these efforts have not been uniformly successful. Commercial mushroom culture is an old and well established industry in Europe and in the United States. It has been estimated that more than 15,000,000 pounds of mushrooms were grown in the United States during 1927. These were used mainly in the fresh condition, but large quantities also were canned.

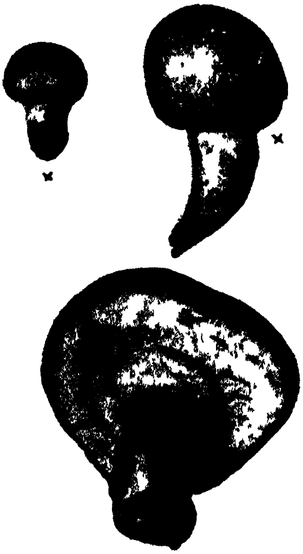

Fig. 1.

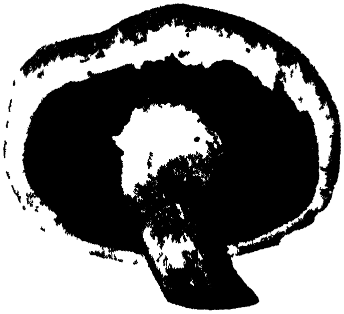

Fig. 2.

The Common Mushroom (*Agaricus campestris*).

Fig. 1.—Young mushrooms; button stage marked x. Later stage below, just prior to rupture of veil

Fig. 2.—Mature mushroom, showing gills and remnant of veil attached to stem in the form of a ring

[*After Gussow.*

There is no doubt that opportunities exist for the development of the mushroom growing industry in this country. Present supplies are unequal to the existing demand, and it may be expected that an increased demand would result if supplies of fresh cultivated mushrooms of high quality were more frequently available.

Successful mushroom culture requires constant and careful attention throughout the whole period of preparation of the compost and subsequent development of the crop, and unless this can be ensured practically all efforts are foredoomed to failure. As a matter of fact, it is somewhat difficult to provide proper conditions for successful mushroom growth, although close attention to the necessary details will enable satisfactory results to be obtained.

Description of the Common Mushroom.

The common mushroom of commerce is a fungus known as *Agaricus campestris.* Other closely allied species are also grown. The mushroom is a plant which differs from most other plants mainly in that it does not possess green colouring matter, and thus does not require sunlight in order that it may build up its food supplies. It is not essential that mushrooms should be grown in dark situations, and the fact that they are commonly cultivated in cellars, caves or tunnels, or in specially constructed houses which do not make provision for outside lighting, is a matter of convenience for ensuring maintenance of suitable temperature and moisture conditions at low cost, rather than a means for the exclusion of sunlight.

The mature mushroom has two prominent features—(1) the cap or pileus, and (2) the stalk, stem or stipe. (Fig. 2.) The cap is an expanded umbrella-like structure which is supported by the stem. On the under-surface of the cap will be observed a number of thin folds which radiate from the point of attachment of the cap to the stem. These structures are the gills or lamellae, and on them are produced the spores which, under appropriate conditions, serve as means of reproduction for the fungus. The spores thus correspond to the seeds of higher plants. The gills of the young mushroom are pink in colour, but the colour changes to brown as the mushroom becomes older.

The young, unopened mushroom is known as a button. (Fig. 1.) The gills are not visible at this stage, as they are covered by a veil which extends from the edge of the cap to the stem. As growth proceeds, the cap expands and the veil is torn, thus exposing the gills. The remnant of the veil attached to the stem is known as the ring or annulus.

The mushroom does not possess roots in the ordinary sence of the term. The spore, on germination, gives rise to a thin thread-like structure, and masses of these threads, known as mycelium, and which are easily recognised by their white colour, ramify through the soil or the compost and secure the materials which eventually are required for the development of the mushrooms. Sometimes the thread-like growths are aggregated into cords or strands, and superficially bear a close resemblance to the roots of higher plants. The spawn of commerce consists of this thread-like fungus growth, which, together with compost, is either compressed and dried in brick form or it may be secured in the form of "pure cultures," that is, cultures of the fungus growing in bottles of sterilised compost. Pure cultures of spawn are widely used in other parts of the world, and are deservedly popular, as they are derived from specially selected mushrooms and are free from the harmful fungi which frequently occur in ordinary brick spawn, and which may cause serious losses in mushroom beds.

Factors in Successful Mushroom Growing.

The following notes have been compiled with a view to making existing information readily available to those who are desirous of attempting mushroom culture in this State.

Fundamental conditions for successful mushroom culture consist in the provision of facilities for the proper control of temperature, moisture, and ventilation. These three factors are related, as temperature and moisture control may be effected to a large extent by means of suitable ventilation. Ventilation is necessary in the first place in order to remove the excess of carbon dioxide which is exhaled by the mushrooms and also to provide the oxygen which is required to sustain growth. Draughts should be avoided, as they may cause a sudden change in the temperature and seriously check the growth of the mushrooms. Ventilation should be such as to provide a gradual exchange of air with as little direct draught over the beds as possible.

Preparation of Compost.

Although mushrooms which are growing under natural conditions develop in soil, this material is not suitable for culture under commercial conditions. Stable manure has been found to be the only satisfactory material for this purpose. Difficulties may occur not only in securing adequate supplies, but also in securing stable manure of satisfactory quality. Manure which has been left in the open for long periods and which has been exposed to the rain is impoverished, and is not suitable for the purpose. The manure should be obtained from grain-fed animals, *e.g.*, from stables in which wheaten or oaten chaff is used as the main feeding stuff, and in which the bedding material is of straw. Manure which is comprised of droppings alone is not satisfactory. A certain amount of straw in the compost improves the condition of the mushroom beds, it helps to prevent excessive accumulation of water, and such beds may bear for long periods.

The proper composting of the manure is also essential. This is a difficult phase of production, and suitable methods to acquire the desired condition in the compost can only be learned by experience. Slightly different methods are required according to the condition of the manure received for treatment. The proper composting or curing of the manure is a fermentation process, which should result in the production of compost suitable for successful growth of mushrooms.

The manure should be collected in the fresh condition each day and piled in a heap under cover, *e.g.*, on the floor of a shed. There is too much danger of the manure becoming too wet for fermentation, and also danger that nutrient materials will be washed out if the manure is left outside. In any case, the manure should be covered to protect it against rain if it cannot be treated in a shed. The manure should be piled in heaps about 4 feet high. They should never be less than 3 feet high, for small heaps do not ferment properly. On the other hand, a high heap may become too hot, with subsequent loss by burning, and with loss of moisture will dry out, thus immediately checking further fermentation in these affected portions. Frost will interfere with proper fermentation, as also will the high temperatures experienced during the summer months.

During fermentation the temperature will rise to about 140 or 150 deg. Fahr, and a satisfactory compost is generally one in which the temperature has remained fairly constantly at about 125 deg. Fahr. for several days. The correct amount of moisture in the manure is essential if the fermentation is to proceed as indicated above. If the manure is dry it must be sprinkled with water while being added to the heap. Experience is the best guide as to the amount of moisture to add. It may be stated that the heap should be moist throughout, but should not be drenched with water. An excessive amount of water prevents fermentation, as previously indicated, but fermentation may set in at any time when the correct degree of moisture is obtained. Should this occur after the compost is set out in the beds, the spawn will be destroyed by the high temperatures which are developed. The manure should be well packed, so as not to include too much air, which may result in burning.

After about five days to two weeks, during which time the temperatures have been watched, the manure should be in a condition for forking over. The manure on the outer portions of the heap should be forked into the centre of the new heap. The moisture content should again be watched, as the manure should still be moist but not excessively so. Water may be added to the drier portions when forming the new heap. A rough guide to the desired moisture content is that the manure should not form lumps or balls which retain their shape after squeezing in the hand. If the compost is too moist it should be forked over several times in succession in order to allow excess moisture to escape. In forming the new heap the manure should be well shaken and mixed, and on completion should be covered with about 2 inches of fine loamy soil. This covering helps to prevent excessively rapid heating, and also helps to retain the heat after the compost has been placed in position for the mushroom beds.

The heap should be left in position for four or five days, and should be again forked over and covered with loam as before. This process should be repeated after another four or five days and again covered with loam. The moisture content should be watched carefully throughout. The squeezing test should be applied when in doubt, and at no time should the compost be moist enough to leave water in the hand after applying the test. The heaps must be kept compact and firm throughout the period of fermentation. Compost may be prepared without the addition of the loam cover, but it is a little more difficult to control fermentation. If this loam is omitted special care must be taken to see that the heaps are well compacted, and any long straw should be removed at each forking-over period. The fermentation process is likely to take place more rapidly under these conditions.

After approximately three weeks from the time of commencement the compost should be in a condition for transference to the beds. It should be dark-brown in colour and should contain just the correct amount of moisture. It should be rather flaky in character or somewhat greasy in appearance, and should easily pass through the fingers. It will have lost most of its strong odour and will no longer steam vigorously. The temperature will have become uniform and moderate, *i.e.*, from about 100 to 130 deg. Fahr. If the temperature of the heap does not materially rise or fall for two or three days the compost can be safely transferred to the mushroom beds.

The Mushroom Beds.

The beds may be situated on the floor of a suitable building, or they may be arranged in a series of specially constructed shelves. It is generally desirable that the beds be enclosed with a wooden framework about 10 inches high. The width of the beds or the distance between shelves is purely a matter of convenience and should be such that the beds are readily accessible. A 3-feet width is generally found satisfactory. Earthern floors help to retain and regulate moisture, but on other surfaces, such as brick or concrete, it is advisable to provide a wooden bottom for the beds.

The compost is transferred to the beds and is first spread evenly in a layer about 3 inches deep. This layer should be gently pounded with a billet of wood or a brick until it is quite compact. The remaining compost is added carefully in the same manner, any lumps should be discarded and each layer should be firmly compacted until the bed is about 10 inches deep. This will help to keep the compost uniformly moist. The compost should have the same moisture content as previously indicated. There should be no free moisture left in the hand after squeezing, yet it should not be too dry. If necessary to moisten at this stage, several very light sprinklings with luke warm water may be applied.

After compacting in the beds a slight rise in temperature should occur. If there is no change, the moisture condition is not correct and the beds should be loosened with a fork and left for twenty-four hours if they are too wet, or moistened if they are too dry, and then pressed down again. The beds should never be made up with compost that is too moist. It is probable that more failures result from this than from any other single cause. The temperature should be taken each day, the thermometer being pushed some 5 or 6 inches into the beds. The temperature in the beds should rise to about 120 deg. Fahr. and then should slowly fall.

Spawning.

The spawn should be ready to add to the beds as soon as the latter are in a condition to receive it. The temperature of the beds should be falling and the spawn should not be added before the temperature reaches 75 to 70 deg. Fahr. If brick spawn is to be used, the bricks should be placed on the surface of the beds for two or three days in order that they may absorb a little moisture. It is not advisable to soak the bricks before using as this may result in failure. The brick is then broken up into about a dozen small pieces of equal size. If pure culture spawn is used, the lumps should be about half the size of a hen's egg.

The pieces are then inserted in the bed at intervals of about 9 inches each way and to a depth of about 1 inch, or the pieces may be placed on the bed and covered with compost to a depth of ½ inch to 1 inch and the compost pressed firmly over the spawn. The beds should not be watered at this stage as the excess of moisture may kill the delicate threads of the fungus. There should be sufficient moisture in properly prepared compost to enable the spawn to develop satisfactorily.

After adding the spawn the beds may safely be held at a temperature of 75 to 70 deg. Fahr. for one week in order to give the mycelium good opportunities for development The temperature should then be allowed to fall gradually until it ranges between 50 and 60 deg. Fahr.

An even air temperature surrounding the beds is an indication of even temperatures in mushroom beds. If the temperature of the air becomes too high the beds will dry out and if it falls too low the beds will become wet and cold. It may be necessary to give the floor and the walls an occasional light sprinkling with water in order to maintain the correct degree of humidity in the air surrounding the beds.

The beds should not be disturbed for about a week or ten days after the addition of spawn. Various mould growths may have appeared on the surface of the compost either just before or after spawning, but these are harmless and will quickly pass away. The spawn should "run" shortly after insertion in the beds, and at the end of about ten days or two weeks will be observed in the form of a whitish mould-like growth which has developed from the pieces of spawn. This should be a strong growth of strands of the fungus which are observed to radiate out into the bed, and should not be confused with the growth of common moulds which may appear on the pieces of spawn themselves

Casing.

When the spawn has run for two or three days the beds should be covered gently with a layer of rich garden soil of a loamy nature. This should be carefully sifted through a half-inch mesh sieve in order to eliminate lumps of soil and rubbish. Heavy clay soil should not be used as this is not sufficiently porous. The soil should cover the beds to a depth of about 1 inch, but it should not be pressed down on to the bed. This surface soil should be kept lightly moistened, but it should not be drenched with water.

If the correct moisture and temperature conditions have been maintained in the bed and in the surrounding atmosphere, and if spawn of good quality has been used, mushrooms should appear in about six weeks to two months from the time of spawning. Excessively low temperatures and low humidities will retard the growth of mushrooms, but cropping may be induced as soon as these factors are corrected. Development may also be retarded if the casing is of unsatisfactory quality, i.e., if it contains too much clay or too much sand.

Clean straw is sometimes placed on the beds to prevent rapid evaporation. If the beds become too dry this condition may be corrected by occasional light sprinklings with water. It is best always to add small quantities of water at intervals of six hours or so until the correct degree of moisture is obtained The watering must never be overdone, although it is safe to add water a little more freely after the mushrooms have appeared.

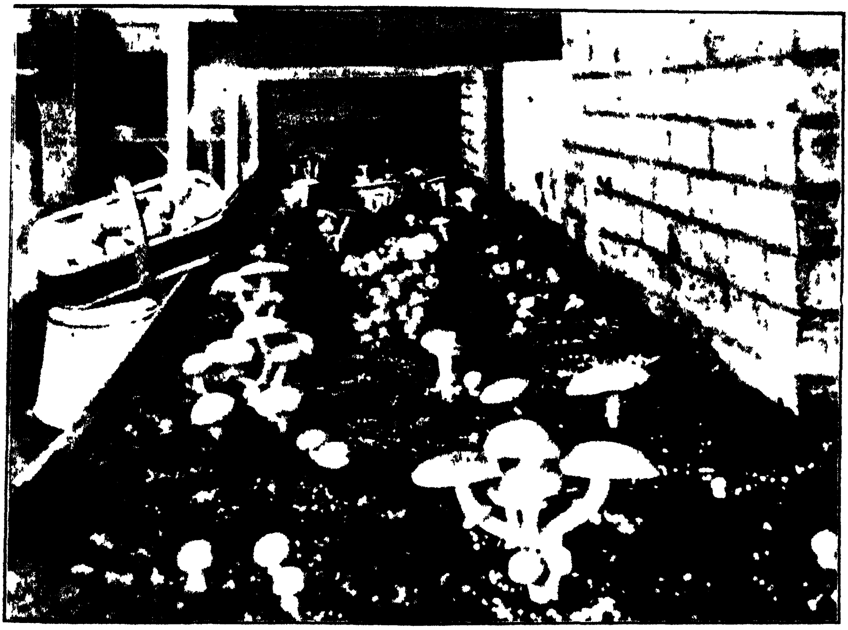

Fig. 3.—A Mushroom Bed in Bearing.

Reproduced from Güssow and Odell

Yields.

A mushroom bed which is kept in good condition should remain in bearing for from three to six months Even longer periods are recorded, but more frequently the inability to maintain suitable moisture and temperature conditions will result in cropping for a short period only An average of 1½ lb. of mushrooms per square foot of bed may be considered as a good yield in each batch of compost A ton of manure should be sufficient to cover about 50 square feet of space.

For market purposes the mushrooms should be collected in the button stage and just before the veil underneath the gills has broken away from the stem. The mushroom should be twisted at the base of the stem and then removed from the bed. Care should be taken to press the soil down over any holes which might be made in picking the mushrooms. Before packing, the stem should be cut a short distance below the ring or point of attachment of the veil to the stem.

Diseases and Pests.

After a period, unless special precautions are taken to avoid loss, cropping may be seriously affected by the accumulation of fungous diseases and insect pests. These may be overcome by a system of heating and fumigation prior to spawning. It is essential that care should be taken in the first instance to avoid the introduction of diseased material into the beds. Should troubles of this character arise growers are advised to communicate with the Department of Agriculture for particulars as to the method of treatment to be adopted.

General.

Practically all of the foregoing refers to the production of mushrooms on a commercial scale. It is advised that any new growers should commence operations in a small way at the beginning in order that experience might be obtained before making any special outlay for a larger venture

Occasional success may be secured by growing mushrooms in tubs or boxes, provided that the manure is composted satisfactorily in the first instance and that subsequent temperature and moisture conditions are suitable for mushroom growth. Mushrooms may also be grown in the open, provided that suitable measures are taken to prevent the beds from becoming excessively moist, that suitable climatic conditions are experienced, and all other factors are favourable.

A cubic yard of manure may be turned into compost of satisfactory quality, but it is more likely that success will follow composting of larger amounts. The large commercial mushroom organisations in other parts of the world find that in dealing with a heap containing between 20 and 30 tons of manure, piled to a height of about 4 or 5 feet and turned and mixed about four times at weekly intervals, that the fermentation is practically controlled automatically. The aeration and the temperatures developed in such a quantity of manure result in satisfactory fermentation, provided that the proper moisture conditions are maintained.

Local growers have experienced difficulty in obtaining spawn of satisfactory quality. Pure culture spawn has been prepared in the laboratories of the Biological Branch of the Department of Agriculture and limited supplies of this material are now available. Moreover, the Department is always at the service of growers should they require advice regarding the solution of any problems connected with the culture of this crop

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Varieties of Maize.

Recommendations for Different Districts.

L. S. HARRISON, Special Agricultural Instructor.

The following varieties of maize are recommended by the Department of Agriculture for planting in the various maize-growing districts of New South Wales. Growers are reminded to make early arrangements for seed supplies, and if in doubt as to which variety to sow to communicate with the Department.

APPROXIMATE ORDER OF MATURITY OF VARIETIES RECOMMENDED.

Very Early.—Early Morn, Golden Glow.

Early.—Wellingrove, Golden Superb, Kennedy, Iowa Silvermine, Auburn Vale, Funk's Yellow Dent, Iowa Goldmine, Large Goldmine, Funk's Ninety-day.

Midseason.—Boone County White, Hickory King, Leaming, Golden Nugget, Early Clarence, Golden Beauty, Murrumbidgee White, Manning Silvermine, Giant White.

Late.—Yellow Hogan, Fitzroy, Large Red Hogan, Ulmarra Whitecap, Pride of Hawkesbury.

VARIETIES RECOMMENDED FOR GRAIN.

Upper North Coast.

(*a*) *Tweed River.*

Early Crop.—Leaming, Iowa Silvermine.

Main Crop.—Fitzroy, Ulmarra Whitecap, Large Red Hogan (for early sowing only).

(*b*) *Lower Richmond River.*

Early Crop.—Hickory King (second-class soils only), Leaming.

Main Crop.—Golden Nugget (second-class soils only), Fitzroy.

(*c*) *Upper Richmond River.*

Early Crop.—Leaming.

Main Crop.—Fitzroy, Large Red Hogan, Ulmarra Whitecap.

(*d*) *Clarence River*

Early Crop.—Leaming, Wellingrove.

Main Crop.—Fitzroy, Ulmarra Whitecap.

Second-class Soils.—Golden Nugget, Hickory King.

(e) *Bellinger River.*

Early Crop.—Leaming, Golden Superb, Iowa Silvermine.

Main Crop.—Fitzroy, Ulmarra Whitecap.

NORTH COAST TABLELAND.

Dorrigo and Comboyne Districts.

Main Crop.—Leaming, Golden Superb.

MIDDLE NORTH COAST.

(a) *Nambucca River.*

Early Crop.—Golden Superb, Leaming, Hickory King, Manning Silvermine.

Main Crop.—Fitzroy, Yellow Hogan.

(b) *Lower Macleay River.*

Early Crop.—Golden Superb.

Main Crop.—Fitzroy, Large Red Hogan, Yellow Hogan, Golden Beauty, Pride of Hawkesbury, Leaming.

(c) *Upper Macleay River.*

Early Crop.—Golden Superb, Funk's Yellow Dent.

Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan, Leaming, Golden Beauty, Hickory King, Giant White.

(d) *Hastings River.*

Early Crop.—Funk's Yellow Dent, Golden Superb.

Main Crop.—Fitzroy, Large Red Hogan, Golden Beauty, Golden Nugget, Leaming, Hickory King, Manning Silvermine.

(e) *Lower Manning River.*

Early Crop.—Funk's Yellow Dent, Golden Superb.

Main Crop.—Fitzroy, Large Red Hogan, Pride of Hawkesbury, Leaming, Golden Beauty, Manning Silvermine, Hickory King.

(f) *Upper Manning River.*

Early Crop.—Golden Superb, Funk's Yellow Dent.

Main Crop.—Fitzroy, Leaming, Golden Beauty, Manning Silvermine, Hickory King.

CENTRAL COAST.

(a) *Dungog, Gloucester.*

Early Crop.—Golden Superb.

Main Crop.—Fitzroy, Hickory King, Leaming, Manning Silvermine, Yellow Hogan.

(b) *Lower Hunter River.*

Early Crop.—Funk's Yellow Dent, Golden Superb.

Main Crop.—Large Red Hogan, Fitzroy, Leaming.

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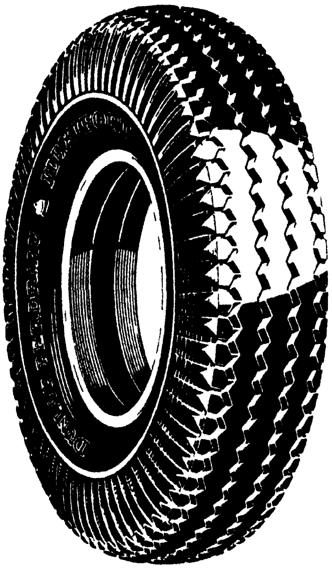

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(c) *Hawkesbury River.*

Early Crop.—Golden Superb.

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Early Crop.—Hickory King.

Main Crop.—Fitzroy.

SOUTH COAST.

(a) *Illawarra District.*

Early Crop.—Funk's Yellow Dent, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan, Boone County White.

(b) *Shoalhaven River.*

Early Crop.—Funk's Yellow Dent.

Main Crop.—Leaming, Funk's Yellow Dent, Fitzroy, Boone County White, Hickory King.

(c) *Milton District.*

Early Crop. Funk's Yellow Dent, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Fitzroy, Large Red Hogan, Leaming.

(d) *Moruya River.*

Early Crop.—Funk's Yellow Dent, Early Morn.

Main Crop.—Large Red Hogan, Fitzroy.

(e) *Bega and Pambula Rivers.*

Early Crop.—Funk's Yellow Dent, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Large Red Hogan, Golden Beauty, Yellow Hogan, Hickory King, Boone County White.

NORTHERN TABLELAND.

(a) *Tenterfield District.*

Funk's Yellow Dent, Golden Glow, Iowa Silvermine, Hickory King, Wellingrove.

(b) *Glen Innes District.*

Strong Soils.—Wellingrove, Iowa Goldmine.

Light Soils.—Wellingrove, Iowa Silvermine.

(c) *Ben Lomond, Llangothlin, Guyra, and Black Mountain Districts.*

Early Morn, Golden Glow.

(d) *Armidale District.*

Wellingrove, Large Goldmine, Golden Glow, Golden Superb.

(e) *Uralla District.*

Wellingrove, Early Morn, Large Goldmine.

CENTRAL TABLELAND.

(*a*) *Bathurst District.*

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

Upland Soils.—Iowa Silvermine.

(*b*) *Colder Districts.*

Early Morn.

SOUTHERN TABLELAND.

Moss Vale District.

Golden Glow.

NORTH-WESTERN SLOPES.

(*a*) *Inverell District.*

Heavy Soils.—Funk's Yellow Dent, Kennedy, Auburn Vale, Funk's Ninety-day.

Light Soils.—Wellingrove, Iowa Silvermine.

Late Sowing.—Early Morn, Golden Glow.

(*b*) *Tamworth and Upper Hunter Districts.*

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

CENTRAL-WESTERN SLOPES.

Aluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

Upland Soils.—Iowa Silvermine, Early Morn.

SOUTH-WESTERN SLOPES.

(*a*) *Tumut River.*

Rich Alluvial Flats.—Main Crop (October sowing), Early Clarence, Murrumbidgee White; Early Crop (late sowing), Funk's Yellow Dent.

Second-class Alluvials.—Funk's Yellow Dent, Iowa Silvermine.

(*b*) *Murrumbidgee River (Gundagai District).*

Funk's Yellow Dent, Iowa Silvermine, Golden Glow.

MURRUMBIDGEE IRRIGATION AREAS.

Funk's Yellow Dent, Iowa Silvermine.

VARIETIES RECOMMENDED FOR GREEN FODDER.

COASTAL DISTRICTS.

Early Varieties.—Hickory King, Leaming.

Late Varieties.—Fitzroy, Pride of Hawkesbury, Ulmarra Whitecap.

TABLELAND DISTRICTS.

For Warmer Districts.—Fitzroy.

For Cooler Districts.—Hickory King, Leaming.

For Coldest Districts.—Wellingrove.

WESTERN SLOPES AND MURRUMBIDGEE IRRIGATION AREAS.

Fitzroy.

Varieties of Wheat in New South Wales.

[Continued from page 438.]

J. T. PRIDHAM, H.D.A., Plant Breeder, and A. R. CALLAGHAN, D.Phil., B.Sc., B.Sc.Agr., Assistant Plant Breeder.

THE varieties that have been described in previous issues are:—Waratah, Federation, Yandilla King, Turvey, Canberra, Nabawa, Bena, Marshall's No. 3, Penny, Hard Federation, Union, Free Gallipoli, Nizam, Currawa, Gresley, Wandilla, Ranee, Riverina, Cleveland, Purple Straw, Aussie, Bomen, Major, Gluyas Early, Minister, Bald Early, Florence, Clarendon, Early Bird, Steinwedel, Comeback, Ford, Gullen, Queen Fan, Caliph and Pusa 4.

As in previous instalments, the varieties dealt with this month are in the order of their relative importance in New South Wales at the time of writing.

Burrill.

Burrill was bred by Mr. S. Plowman, of Parkes, New South Wales, from the cross Warden x Hard Federation.

This variety tillers well and is vigorous in early growth; it has tall, fine, white straw with good strength. The long, white ears are fusiform and lightly tip-awned; the outer glumes are narrow and in the lowermost the shoulders are oblique, becoming rounded to square in those situated higher in the ear. The grain is opaque, dark yellow and classed in the weak-flour group.

Burrill is a mid-season, hardy, dual purpose variety of some promise, although it is susceptible to both flag smut and stem rust, as well as to foot-rot. It has only been under trial for a few years, but its performances to date indicate that further trials are desirable

Duchess.

There is every indication that Duchess originated from a natural cross between Federation and Minister; it was first selected by a farmer in the Riverina district.

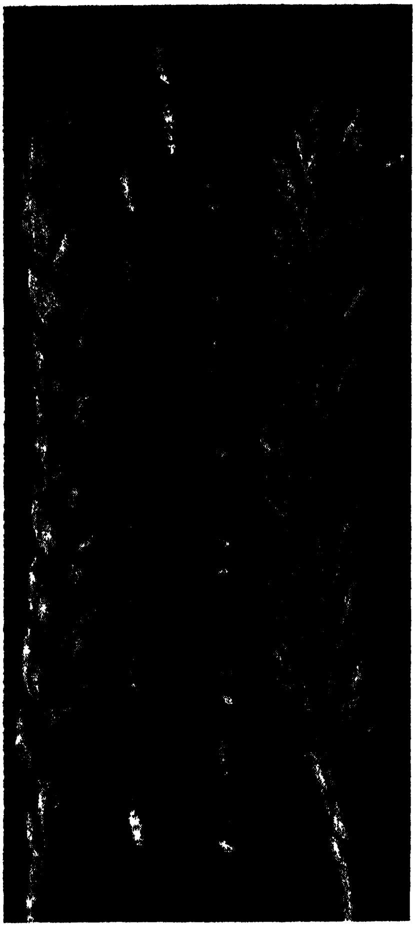
The straw is of medium height, white, fairly fine and somewhat brittle, especially just below the spike. This latter feature of straw weakness has prejudiced the popularity of the variety considerably. The ears are brown, broadly clubbed and bald, characters which alone make the variety easy to identify. The ears of Nizam are also bald and brown, but never so broadly clubbed. The yellowish coloured grain is elliptical, of good quality, hard, and rather flinty; it belongs to the medium-strong flour wheats.

It is a mid-season to late variety, highly susceptible to flag smut and stem rust, and susceptible to foot-rot. It possesses inherent yielding ability and holds its grain well, but its liability to disease and its weak straw are serious handicaps.

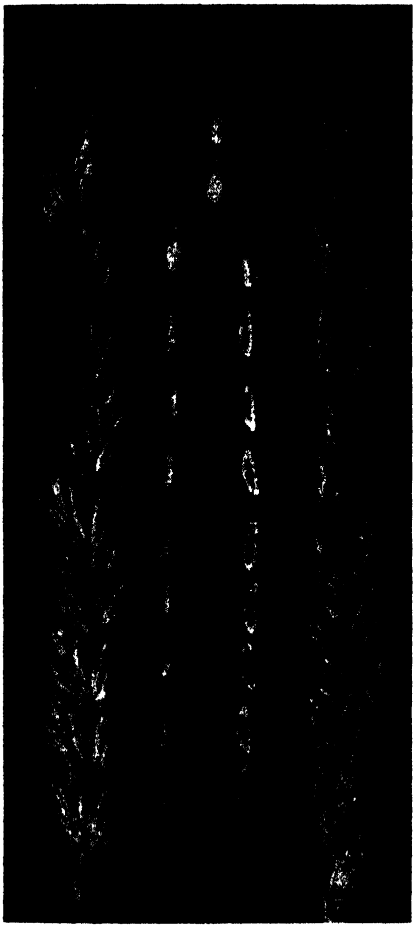
Exquisite.

Exquisite resulted from a cross made at Roseworthy Agricultural College, South Australia. It has the pedigree Gluyas x Atalanta x Gluyas; the parent variety, Atalanta, is a durum wheat.

In early growth it is medium-prostrate and tillers well. It has tall, strong, semi-solid, white straw bearing heads that droop over very noticeably before and, especially, after ripening. The ears are light brown, very long, lax, tapering, and tip-awned. The outer glumes are long and narrow, with narrow oblique shoulders; those near the tip have some inclination to be round. The grain is dark yellow, long and elliptical, with a deep crease, and is very often pinched; it is included in the weak-flour class.

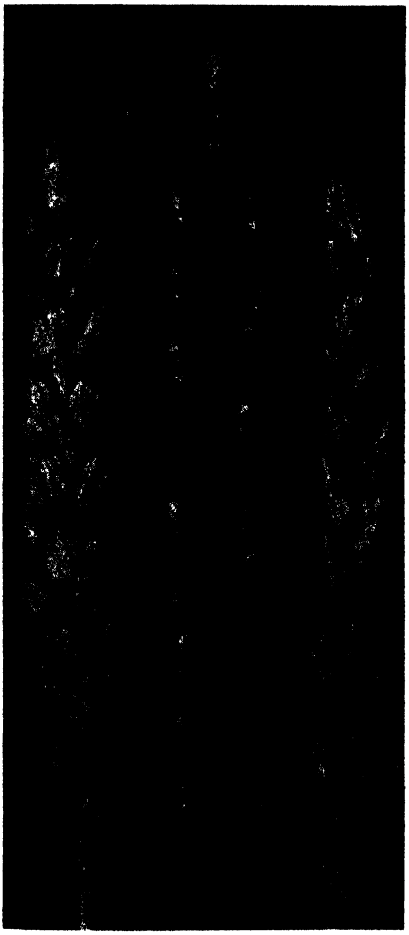


Burrill.



Exquisite.

It is susceptible to foot-rot and stem rust, but is highly resistant to flag smut. The flag smut resistant qualities, which have been inherited from the durum parent, are chiefly responsible for its extended trial. Although a productive variety it is less drought resistant than Yandilla King, and, in the absence of finishing rains, it is very subject to haying-off and yields a very pinched grain sample.



Sultan.

Bredbo.

Sepoy.

Sepoy is a Victorian wheat which was bred from the cross Currawa x Indian H. x Federation.

It is a stiff, erect-growing type with short, rather brittle straw. The ears which are carried erect, are brown, narrowly clubbed and tip-awned.

The outer glumes are short with broad square shoulders; in the green condition a brown lining to the glumes is a distinctive characteristic. The grain threshes readily; it is large and elliptical with a deep crease.

In recent years Sepoy has risen rapidly in favour in Victoria as a late-maturing variety and is now the seventh leading variety of that State. It has not yet received much attention in New South Wales. Sepoy is susceptible to both stem rust and flag smut.

Sultan.

Sultan was bred in South Australia by crossing King's White and Caliph.

For an early-maturing variety Sultan tillers well. It has medium-tall to tall, white, strong, thick-walled straw. The ears are white, long and tapering, very lax and tip-awned. The outer glumes are medium-long and medium-wide with elevated shoulders. Prior to ripening, the ears are characteristically greyish-green. The grain is elliptical, rather opaque and is grouped in the weak-flour class.

Sultan is susceptible to flag smut, stem rust and leaf rust. It is an early-maturing variety that has succeeded well on the light mallee soils of South Australia, and although it occupies the sixth position of importance amongst the wheats of South Australia it has not shown particular promise under New South Wales conditions. It is, however, receiving careful trial in this State.

Bredbo.

Bredbo is a sister wheat to Bena, both of which originated from a selection made from Hard Federation. The selection is thought to have been a natural cross between Hard Federation and Marshall's No. 3.

Like Bena, it is a mid-season variety, but stools a little better. Although the ears are brown, tip-awned, medium-dense, and generally like Bena, they are shorter and have not the same bold, prolific appearance. The grain is medium-sized and oval and is classed as medium-strong.

Bredbo has not the yielding ability of Bena or of other more desirable mid-season wheats, and it is extremely liable to flag smut and stem rust.

Bogan.

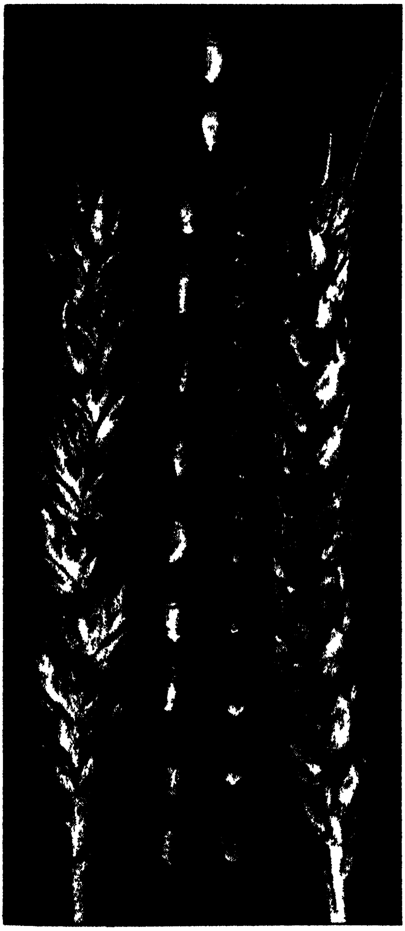
Bogan resulted from a cross made between Bungo and Canberra by Mr. S. Plowman, of Parkes, New South Wales.

It is an early-maturing variety, coming into ear a few days before Waratah. The straw is of medium-height, but rather weak, bearing light-brown, tip-awned ears of attractive appearance. It has a distinct tendency to shatter its grain as soon as ripe, a defect which is accompanied by weak straw and extreme susceptibility to flag smut and stem rust.

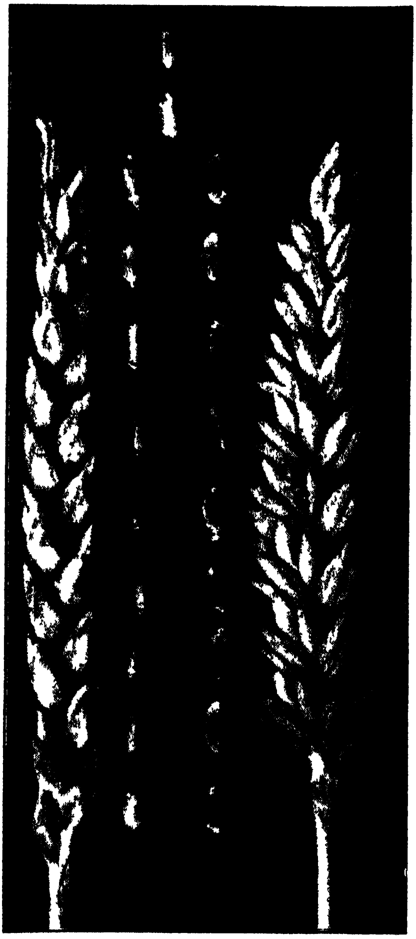
Baringa.

Baringa was bred from a cross made at Cowra Experiment Farm in 1915 between Gullen and Bomen. The cross was designed to replace Bomen with a white-grained variety.

For a mid-season wheat Baringa tillers very well. It has medium-tall, rather fine straw of good strength and standing ability. The ears are borne erect, are medium-dense and uniform, white and totally bald. The glumes are pubescent (commonly spoken of as "woolly chaffed") and the outer glumes have oblique shoulders, two characters which make the variety easy to identify. The grain is of a dark-yellow hue, hard and fairly flinty; it is classed as a medium-strong wheat.



Bogan.



Baringa.

Besides producing grain of good quality, Baringa has other leading characters of agronomic worth. Chief of these is its inherent yielding ability, which, coupled with its moderate resistance of flag smut and stem rust, give it many advantages over other mid-season varieties. It holds its grain tenaciously and no losses are likely to occur through shattering; it is difficult to strip under some conditions. Baringa is a good dual purpose type and its productiveness and disease resistance justify extension of its trial in New South Wales. Its performances at Wagga Experiment Farm have been especially satisfactory, as it has been more productive than all mid-season and late varieties under trial during the past six years.

(*To be continued.*)

UNIT VALUES OF FERTILISING MATERIALS.

THE unit values of fertilising ingredients in different manures for 1931 are as follows:—

	Per unit. s.	d.
Nitrogen in nitrates...	20	3
,, ammonium salts	13	11
,, blood, bones, offal, &c.	15	8
Phosphoric acid in bones, offal &c.	5	3
,, (water soluble) in superphosphate ...	4	9
Potash in sulphate of potash	6	8

To determine the value of any manure, the percentage of each ingredient is multiplied by the unit value assigned above to that ingredient, the result being the value per ton of that substance in the manure. For example, bonedust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid:—

4 × 15s. 8d. = £3 2s. 8d. = value of the nitrogen per ton.
20 × 5s. 3d. = £5 5s. 0d. = ,, ,, phosphoric acid per ton.

£8 7s. 8d. = value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time it has been attempted to make the standard indicate as nearly as possible the fair retail value of the manurial ingredients, and it will be found in the majority of cases the price asked and the value assigned are fairly close.

It will be noted that the unit value of nitrogen in ammonium salts and in bones, &c., as well as that of phosphoric acid in superphosphate show a decrease compared with unit values obtaining in 1930.

Compared with 1930 prices the unit value of nitrogen in nitrates has increased 2.5 per cent., but the value of nitrogen in ammonium sulphate and in bones, &c., has decreased 6.2 and 16.8 per cent., respectively.

The unit value in phosphoric acid in superphosphate has decreased 1.7 per cent., but that of potash in sulphate of potash has increased 5 per cent.

The price of the nitrogen in bones, &c., is 1s. 9d. per unit (6.8 per cent.) more than in ammonium salts, and the value of the phosphoric acid 6d. per unit (5.3 per cent.) higher than in superphosphate.—A. A. RAMSAY, Chief Chemist.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Wheat—

Aussie	Manager, Experiment Farm, Trangie. J. Parslow, "Cooya," Balladoran.
Baroota Wonder	Manager, Experiment Farm, Temora.
Bobin	Manager, Experiment Farm, Trangie. Manager, Experiment Farm, Condobolin. Manager, Experiment Farm, Cowra.
Canberra	Manager, Experiment Farm, Trangie. Manager, Experiment Farm, Condobolin. Freudenstein Bros., Post Office, Tyagong. F. Penfold, "Bluevale," Boggabri.
Clarendon	C. Anderson, Swan Vale Post Office, *via* Glen Innes. J. Parslow, "Cooya," Balladoran.
Duri	Manager, Experiment Farm, Cowra.
Firbank	Manager, Experiment Farm, Condobolin.
Gluyas Early	Manager, Experiment Farm, Temora.
Gresley	Manager, Experiment Farm, Bathurst.
Gullen	Manager, Experiment Farm, Temora.
Hard Federation	Manager, Experiment Farm, Trangie. L. R. Harton, "Ferndale," Werris Creek.
Nabawa	Manager, Experiment Farm, Trangie. G. Hand, "Hill View," Narromine. H. McFadyen, "Lochbine," West Wyalong. Whitfield Bros., "Gamble," Binnaway. R. B. B. Gibbs, "Glenmore," Old Grenfell Road, Forbes. Manager, Experiment Farm, Condobolin. A. D. Dunkley, "Bon Lea," Brundah, Grenfell. J. H. Harvey, "Kindalin," Dubbo. J. Parslow, "Cooya," Balladoran. R. Massingham, "Aylmerton," Binnaway. J. Berney, "Eurimbla," *via* Cumnock. B. J. Stocks, "Linden Hills," Cunningar. F. Penfold, "Bluevale," Boggabri.
Wandilla	Whitfield Bros., "Gamble," Binnaway.

***Wheat*—continued.**	
Waratah	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Bathurst.
	T. W. Abberfield, "Wongo Creek," Alexander Park.
	G. Hand, "Hill View," Narromine.
	Manager, Experiment Farm, Temora.
	S. E. Nash, "Lockwood," *via* Canowindra.
	B. J. Stocks, "Linden Hills," Cunningar.
	E. Idiens, "Kangarooby," Goolagong.
	F. Penfold, "Bluevale," Boggabri.
Oats—	
Belar	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
	D. H. Deering, "Kurralta," Piambra.
	H. E. Ward, "Gwenvale," Parkes.
Buddah	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
College Algerian	Manager, Experiment Farm, Bathurst.
Gidgee	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Trangie.
Mulga	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
	C. Bennett, Forbes-road, Cowra.
	H. E. Ward, "Gwenvale," Parkes.
Sunrise	Manager, Experiment Farm, Trangie.
	Manager, Experiment Farm, Cowra.
White Tartarian	E. D. Ogilvie, "Ilparran," Matheson, via Glen Innes.
	Manager, Experiment Farm, Bathurst.
Maize—	
Fitzroy	Manager, Experiment Farm, Grafton.
Leaming	Manager, Experiment Farm, Grafton.
Murrumbidgee White	M. Leitch, Bulgary Private Bag, Wagga.
Barley—	
Cape	Manager, Experiment Farm, Bathurst.
Potatoes—	
Factor	C. Barberie, Batlow.
	R. Quarmby, Batlow.
	C. Buchele, Box 47, P.O. Batlow.
Field Peas—	
Black Eye	H. Garside, Dartbrook, Aberdeen.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

EMBARGO ON POULTRY ENTERING NEW ZEALAND.

ADVICE has been received from the New Zealand Department of Agriculture to the effect that poultry from Australia will not be admitted into New Zealand unless accompanied by a certificate to the effect that the birds have been examined, that the state from which they came has been free from Newcastle disease for two years, and that the poultry are the product of the state from which sent.

Persons wishing to despatch poultry to New Zealand should therefore communicate with the Chief Veterinary Surgeon of the Department of Agriculture, Box 36A, G.P.O., Sydney.

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Farm Forestry.

V. THE NATIVE AND INTRODUCED TREES OF NEW SOUTH WALES.

[Continued from page 34.]

R. H. ANDERSON, B.Sc.Agr., Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, University of Sydney.

THE COASTAL DIVISION—*continued.*

Native Trees of the Coastal Division—*continued.*

APPLES (*Angophora* spp.).

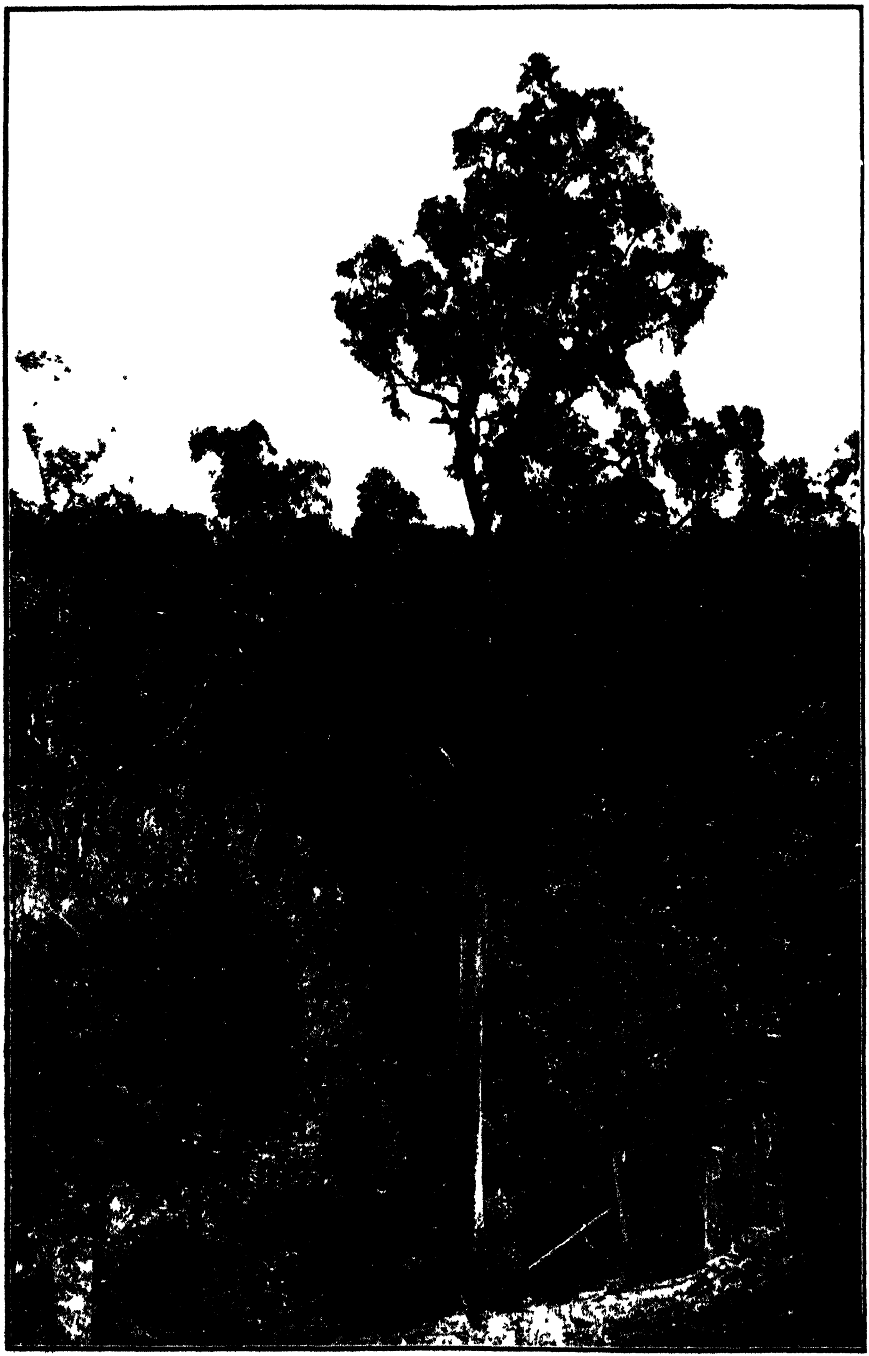
FIVE species of Apple occur in the Coastal Division, viz., Smooth-barked Apple (*Angophora lanceolata*), Broad-leaved Apple (*Angophora subvelutina*), Rough-barked Apple (*Angophora intermedia*), Small-leaved Apple (*Angophora Bakeri*), and *Angophora ochtrophylla.* (For general botanical notes on this genus see *Agricultural Gazette*, 1928, page 919.)

The Smooth-barked Apple (*Angophora lanceolata*) is a medium-sized tree widely distributed throughout the Division on poor sandstone soil. It is extraordinarily well adapted to the more exacting soil conditions, often flourishing on what appears to be bare sandstone with little shallow pockets of soil. It has typically a spreading crown with twisted, rather gnarled limbs, giving the tree a very picturesque appearance. The smooth bark is deciduous in large flakes during the spring months, leaving a fresh pink under-surface. Kino is produced freely, and is usually found staining parts of the trunk or branches. In the Sydney district it is often known as Red Gum, a name, however, which is better reserved for some of the smooth-barked Eucalypts.

Uses.—It makes a useful shade and ornamental tree and is especially suited for poor sandstone soils where few species will flourish. The timber is strong, moderately heavy, but is generally gum veined and has been neglected in favour of better timbers. It is, however, of general usefulness, and makes good, freely-burning fuel.

The Broad-leaved Apple (*Angophora subvelutina*) is a medium-sized tree with spreading crown and rather dense foliage, found fairly commonly on heavy, moderately rich soils in the central and northern subdivisions. The bark is rough, persistent, and furrowed, but the tree can be distinguished from other rough-barked Apples by the leaves being usually without stalks and heart-shaped at the base. It is moderately useful for shade and shelter purposes, and the fairly heavy and strong timber is often used for fencing purposes.

The Rough-barked Apple (*Angophora intermedia*) is found mainly on fairly good and deep soils, and is widely distributed throughout the Division. It frequently forms an attractive umbrageous tree, and is useful for shade and shelter purposes. (See also *Agricultural Gazette*, 1928, p. 919.)



Smooth-barked Apple (*Angophora lanceolata*).

The Small-leaved Apple (*Angophora Bakeri*) is a small tree, occasionally reaching medium size, found on rather poor sandy soil in the central and northern subdivisions, but mainly in the Sydney district. It has a rough bark, but is distinguished by the foliage, which is smaller and narrower than in other Apples. The species could be used for planting for ornamental and small shade purposes in poor sandy types of soil.

The remaining Apple, *Angophora ochrophylla*, is found in a number of localities in the Division, but its exact distribution has not yet been determined

Melaleuca spp

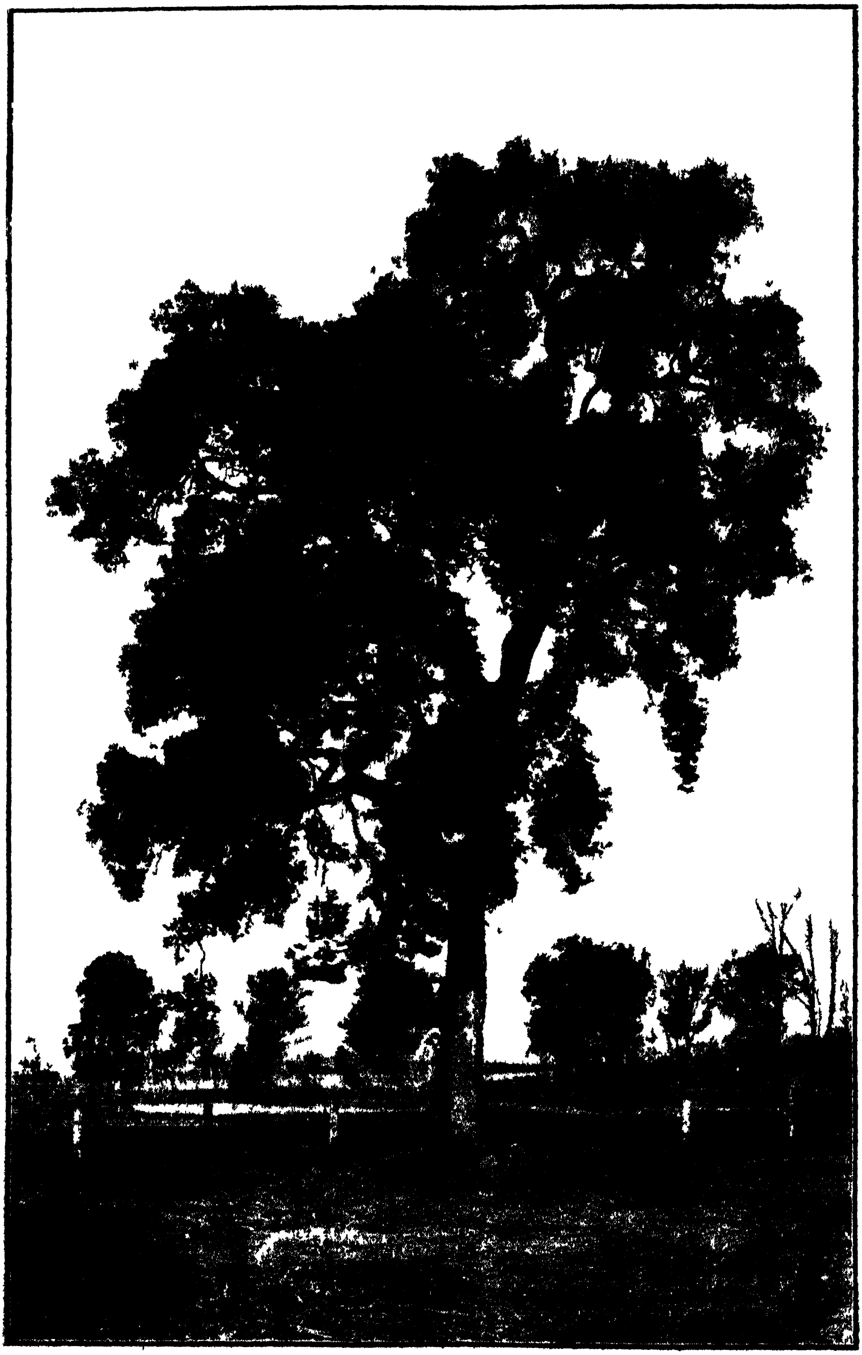
A number of these species are found in the Division, including several important trees. They are widely known as Tea-trees or Paper Barks, and are commonly found on brackish soil or damp flats in many parts of the Division. Botanically they are characterised by the flowers having small petals but numerous and long stamens which are united into five bundles, and give the flower its characteristic appearance. The flowers are without stalks, and clustered in spikes or heads. The fruits consist of small woody capsules which are closely sessile on the branches and contain numerous small seeds. A number of the species rarely exceed a large shrub in size, but those which attain tree size include the following:—

Broad-leaved Tea tree (*Melaleuca leucadendron*), a variable species characterised by elliptical or lanceolate leaves 2 to 5 inches long. The bark consists of layer upon layer of thin papery sheets, and is used for a variety of purposes, including lining for fern baskets, &c. The tree is small to medium-sized, and forms an excellent shade and shelter tree, especially on rather brackish or moist soil It is found northwards from the Shoalhaven River, and includes a number of forms, some of which have been distinguished as separate species. The timber is hard, light-brown, and close-grained, rather attractive in appearance, and regarded as very durable in water or moist ground.

The Prickly-leaved Tea-tree (*Melaleuca styphelioides*) occurs as a small to medium-sized tree with paper bark in brackish soil on damp sites in many parts of the Division northwards from the Shoalhaven River. It is characterised by the small prickly-pointed leaves about ½ inch long. The timber is close and straight grained, reddish-brown in colour, and is reputed to be very durable in damp ground and water. The tree is useful for shade and shelter, and is of pleasing appearance.

Both the above species are especially suited for planting for shelter or ornamental purposes in brackish soil or similar sites throughout the Division.

Two other species of Tea-trees have lately received considerable attention as yielding valuable essential oils with distinct commercial possibilities. These are *Melaleuca linariifolia* and *Melaleuca alternifolia*. The former is a small to medium-sized tree with paper bark found both north and south of Sydney in damp situations. It has small narrow leaves about 1 inch



Broad-leaved Apple (***Angophora subvelutina***) long, and often forms a rather dense tree which provides shade and shelter. The essential oil is a valuable one, but the tree does not occur in sufficiently large and convenient areas to permit its commercial exploitation for the present.

The closely allied species, *Melaleuca alternifolia,* seldom reaches any size, being usually only a small tree. It has small linear leaves, narrower than those of *Melaleuca linariifolia.* It occurs mainly from Stroud to the Richmond River, and in some places covers extensive areas with a fairly dense growth. The oil yielded possesses valuable germicidal and other properties, and the large areas of natural growth available, combined with convenient water supply for distilling, indicate distinct commercial possibilities. The species suckers freely, so that areas cut over soon produce abundant growth.

A number of other *Melaleucas* occur in the Division, but these seldom attain any size, being mainly shrubby in growth, although sometimes forming small trees.

BOTTLE BRUSHES (*Callistemon* spp.).

A number of Bottle Brushes occur in the Division, but the majority seldom attain the size of a tree. Botanically, the various species are characterised by the flowers being in dense showy spikes, by the narrow leaves, and by the small woody capsules which rest closely on the branches. The species are of horticultural interest, and are frequently cultivated as garden shrubs.

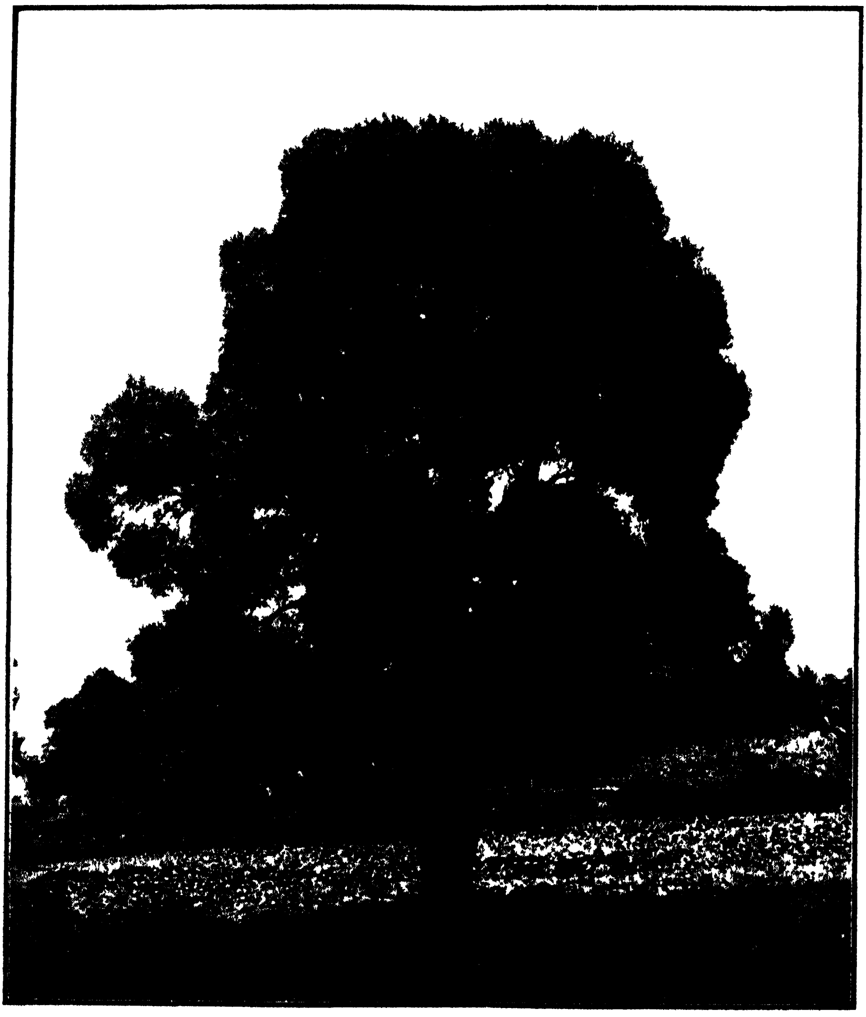
The two species which reach tree size are the Drooping Bottle Brush (*Callistemon viminalis*) and the White Bottle Brush (*Callistemon salignus*).

The Drooping Bottle Brush forms a tall shrub or small tree, sometimes reaching 60 feet in height, with a coarse persistent bark becoming somewhat flaky. The branches are usually more or less drooping in fully-grown trees, but in younger plants are more upright. The flower spikes are red. It is found along the banks and beds of streams northwards from the Hunter River, ascending to the tablelands in parts The reddish timber is close-grained, strong and tough, and occasionally used for tool-handles boats' knees, and braces.

The White Bottle Brush is a small tree up to 40 feet in height with papery bark and more or less drooping habit, and is distinguished by the pale or creamy yellow spikes of flowers. It occurs on a fairly wide range of sites, both in brackish soil and dry hillsides northwards from the Shoalhaven River. The dull drab to dark-red timber is hard and strong, and reputed to be durable in damp ground as fencing posts, &c

BLACK PENCIL CEDAR (*Tieghemopanax elegans*).

A small to medium-sized tree with grey, somewhat wrinkled bark found in brush lands from the Illawarra district northwards to Queensland. It is frequently palm-like in appearance, with a clean trunk capped by an umbrella-like mass of handsome foliage. The fresh bark is often characterised by a faint odour of celery, giving rise to the vernacular name of "Celery Tree" or "Celery Wood."



Broad-leaved Tea-tree (*Melaleuca leucadendron*).

"Leaves large, compound, pinnate, the leaflets ovate or broadly lanceolate, 2 to 5 inches long. Flowers in large panicles, the individual flowers small and consisting mainly of the combined and flattened calyx and ovary. Fruits numerous, more or less circular, flattened, about ¼ inch wide and with two persistent styles."

Uses.—The species is an ornamental one and worthy of cultivation for its handsome leaves and somewhat unusual appearance. The timber is soft, light, and splits freely, but is seldom used, as it is not durable and cracks badly unless carefully seasoned.

The closely allied species, *Tieghemopanax Murrayi*, is also known as "Pencil Cedar" or "Umbrella Tree," and resembles the above species, differing chiefly in the large leaflets, which are up to 10 inches long, and in the structure of the inflorescence. It is found in brush lands both north and south of Sydney, and is an ornamental species.

A third species, *Tieghemopanax sambucifolius*, occurs very commonly both in the Coastal and Tableland Division, but is usually a shrub and seldom becomes arborescent.

RAPANEA (*Rapanea variabilis*).

A small tree, occasionally reaching 50 feet in height, found throughout the Division and ascending to the tablelands in parts. It is occasionally known as "Mutton Wood," but has no generally accepted common name.

"Leaves variable from narrow lanceolate to broadly obovate, rather thick, shining on the upper surface, toothed or occasionally quite entire. Flowers small, greenish-white, clustered, the petals united into a 4-lobed tube about ⅛ inch long. Fruits globular, ¼ inch diameter, profusely produced, more or less translucent, and white to purple in colour."

Uses.—It is an attractive little tree, and is more or less useful for ornamental and shelter purposes. The pale-coloured timber is hard and occasionally used for tool-handles, but it is not a timber tree.

An allied species, *Rapanea Howittiana*, is also found fairly commonly in the Division, particularly in the northern brushes. It carries a profusion of blue or purple berries, and although very similar in appearance to *Rapanea variabilis*, is distinguished by the tube of the flower being 5-lobed and by the leaves being more rounded at the top, rather thinner, and always entire.

THE BLACK APPLE (*Sideroxylon australe*).

A medium to fairly large-sized tree with a rough bark which exudes a milky sap when cut. It is found fairly commonly from the Illawarra district northwards to Queensland in brush forests, and is also known as "Wild Plum." The large, black, plum-like fruits are characteristic and freely produced.

"Leaves alternate, elliptical, 2 to 5 inches long, rather thick, shiny, and with fairly prominent venation. Flowers about ¼ inch long, in clusters of two to six. Fruit black, plum-like, 1 to 2 inches diameter, containing three to five large flattened seeds with hard glossy brown coats."

Uses.—The species is an ornamental one, and is occasionally cultivated in gardens. The timber is pale yellow with darker markings, close-grained, hard, and said to be excellent for woodcarving, printers' blocks, &c., being a good substitute for imported Boxwood.

Four other species of *Sideroxylon* occur in the Coastal Division, but are not nearly as common as the above species:—

Sideroxylon Pohlmanianum and *Sideroxylon Richardi* have fairly large black fruits, and are also known as Black Apples.

Sideroxylon myrsinoides occurs fairly commonly in the northern subdivision as a small tree with smaller leaves and fruits than those of the Black Apple.

MYRTLE EBONY OR BLACK MYRTLE (*Diospyros pentamera*).

A medium-sized tree occasionally exceeding 100 feet in height, with a dark-coloured, fairly rough bark, found in the brush lands in the northern subdivision.

"Leaves alternate, rather thick, elliptical in shape, often slightly yellow on the under-surface and with indistinct venation. Male and female parts in separate flowers. Fruit globular, ¼ to ¾ inch diameter, often dull red and strongly scented.

Uses.—Although a not uncommon species it appears to be little used for any purpose. The timber is occasionally used for tool-handles and indoor work, but appears to be of little importance.

An allied species, *Diospyros Cargillea* often known as the Black Plum, is fairly widely distributed both north and south of Sydney in brush forests. It forms a compact leafy small tree or shrub with thick shiny leaves and black oval fruits up to ¾ inch long.

NATIVE OLIVE (*Olea paniculata*).

A medium-sized tree with a somewhat wrinkled bark, found in brush forests northwards from the Hunter River.

"Leaves opposite, lanceolate or ovate, dark green and glossy, on stalks of about ½ inch long. Flowers small, in loose panicles. Fruit egg-shaped, more or less succulent, about ½ inch long, bluish-black, single-seeded."

Uses.—The timber is hard, close-grained and often somewhat streaked, giving it a marble-like appearance, but appears to be very little used. The tree might be suitable for ornamental and specimen planting in the northern portion of the division.

NOTELAEA (*Notelaea longifolia*).

A shrub or small tree widely distributed through the division on various sites, but reaching its best development in the shelter of gullies not far from the coast. It is sometimes known as "Mock Olive."

"Leaves opposite, fairly strongly nerved, 2 to 5 inches long, on short stalks. Flowers very small in short racemes of barely 1 inch long. Fruit succulent, bluish-black, one-seeded, about ⅓ inch long."

Uses.—The timber is pale-coloured, hard and close grained, but is too small for most purposes. The species might be grown in garden shrubberies, &c.

White Beech (*Gmelina Leichhardtii*).

A medium-to large-sized, partly deciduous tree with a grey scaly bark, found in rain forests in the central and northern subdivisions as far south as the Shoalhaven River. Owing to the demand for its valuable timber, the tree is now a rare one in the more accessible areas.

"Leaves ovate, rather broad, 4 to 6 inches long, hairy and with very prominent venation on the undersurface. Flowers large, more or less tubular and deeply lobed, about ¾ inch long, white with purple or yellow markings. Fruit a succulent, nearly globular blue or mauve drupe about 1 inch diameter."

Uses.—The timber is one of the most useful of the rain forest species. It is moderately light, seasons well, is easily worked, and is strong, tough and durable. It is used for indoor joinery, flooring, cabinet and carving work. The species is regarded as one of the most suitable for regeneration forestry work in rain forest areas. Seed is freely produced, but difficulty is sometimes experienced in propagation owing to the hardness of the seed and its liability to insect attack.

Ehretia (*Ehretia acuminata*).

A medium-sized tree, found chiefly on the margins of brush forests and along creek banks in the central and northern subdivisions as far south as Nowra.

"Leaves alternate, more or less elliptical, thin, toothed margins, 3 to 6 inches long, on stalks of about 1 inch. Flowers in panicles, the individuals white and strongly scented. Fruit a small yellow berry up to ¼ inch diameter."'

Uses.—The species is quite an ornamental one and worthy of planting on fairly good deep soils in the Division. The timber is moderately useful for indoor work and cabinet purposes.

Corkwood (*Duboisia myoporoides*).

A small tree, occasionally reaching 40 feet in height, with a grey corky bark found on the fringes of brushes and in more open forests in the central and northern subdivisions, extending as far south as the Shoalhaven River.

"Leaves alternate, entire, 2 to 4 inches long, narrowed at base into a short stalk. Flowers small, bell shaped, about ¼ inch long, white with purplish stripes. Fruit a small black globular berry, usually borne in profusion."

Uses.—The leaves contain a valuable alkaloid, duboisine, and before the war were much in demand by Germany. The drug possesses a similar action to atrophine and possibly has other chemical properties. Inquiries by private firms during recent years indicate that the commercial exploitation of the tree is still being carried out or contemplated. The timber has been used for wood-carving. Propagation can be secured from seed or from well-ripened cuttings.

MANGROVES.

Several species are known by the name of Mangrove, but the two common species in this State are *Avicennia officinalis* and *Aegiceras majus.*

The former is sometimes known as Grey Mangrove and is widely distributed along the sea coast, mainly in estuaries or mud flats covered by the tide at high water. It is a small tree with thick opposite leaves which are whitish on the undersurface. The flowers are inconspicuous, forming small heads, and the fruit is a compressed, somewhat fleshy, two-valved capsule. Of late years the sticks from this tree have been widely used in oyster culture, a purpose for which they are particularly suitable, and the heavy demands have resulted in a serious shortage of supplies. Re-growth appears to be slow. The timber is pale-coloured and very hard and is occasionally used for boat knees and other parts of boat building. The bark contains tannic acid, but is much inferior for tanning purposes to the recognised trade barks of other species. The leaves are eaten by cattle to some extent.

The other Mangrove, *Aegiceras majus* frequently referred to as River Mangrove, is a tall shrub or small tree with sweetly-scented white flowers, thick broad coriaceous leaves and horn-shaped fruits of about 1 inch long. It is found along salt water, usually a little way up the rivers, from Botany Bay to Queensland. It has no present value.

(To be continued.)

WHEAT POOL BALLOT TO BE TAKEN ON 17TH JULY.

THE poll to decide whether a Wheat Marketing Board for New South Wales shall be constituted under the Marketing of Primary Products Act, 1927-31, will be taken by postal vote on 17th of this month (July). Those entitled to vote are growers whose names are on the roll of wheat producers. Voting is compulsory; penalty not exceeding £2.

The Returning Officer for the poll is the Director of Marketing, Department of Agriculture, Box 36A, G.P.O., Sydney, and all ballot-papers must be posted in time to reach him not later than 5 p.m. on 17th instant.

MODIFICATION OF REGULATION REGARDING NEWCASTLE DISEASE.

IN view of the improved situation regarding Newcastle disease in Victoria, states Mr. Max Henry, Chief Veterinary Surgeon of the Department, certain modifications have been made in the regulations recently imposed in this connection. The regulation regarding the introduction of live fowls has not been altered, but all restrictions on the movement of dressed poultry and eggs from states other than Victorian have been removed. Eggs and dressed poultry may now be introduced from Victoria if accompanied by a declaration and certificate to the effect that they were not produced within 15 miles of a holding on which an outbreak of Newcastle disease occurred within the last three months.

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Prepares the cow for Calving and wards off milk fever. Sold in air-tight and damp-proof canisters.

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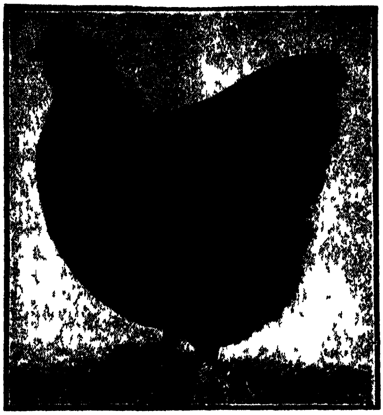

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The class required to improve farm flocks.

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G. D. ROSS, Under Secretary,
Department of Agriculture,
SYDNEY.

A Maintenance Ration for Sheep.

THE SECOND YEAR'S FEEDING EXPERIMENTS AT TRANGIE EXPERIMENT FARM.

L. H. BEVERIDGE, H.D.A., Assistant Sheep and Wool Instructor.*

FOLLOWING the conclusion of a trial at Trangie, in which a number of simple feeds were used to determine suitable maintenance rations for sheep during drought periods (a report of which appears in the June, 1930, *Gazette*, page 458), another trial was commenced on 1st November, 1929, and concluded on 28th July, 1930. In this trial more elaborate rations were fed, including four proprietary concentrates.

Plan of the Experiment.

Nine groups of five Merino ewes were selected for evenness of body-weight and type of wool, and were fed in bare yards with suitable shelter for a period of 270 days (approximately nine months).

The rations fed consisted of :—

Group 1 ...	1 lb.	hay (cereal)		per head per day.
Group 2 ...	1 lb.	,,	,,	and 4 oz. maize per head per day.
Group 3 ...	1 lb.	,,	,,	and 4 oz. Concentrate No. 1 per head per day.
Group 4 .	1 lb.	,,	,,	and 4 oz. Concentrate No. 2 per head per day.
Group 5 ...	1 lb.	,,	,,	and 4 oz. Concentrate No. 3 per head per day.
Group 6 ...	1 lb.	,,	,,	and 4 oz. Concentrate No. 4 per head per day.
Group 7 ...	1 lb.	,,	,,	2 oz. Concentrate No. 2 and 2 oz. maize per head per day.
Group 8 ..	1 lb.	,,	,,	and 4 oz. paddy rice per head per day.
Group 9 .	1 lb.	,,	,,	and 4 oz. maize per head per day.

Free access was allowed to a salt lick consisting of :—

Epsom Salts	6 per cent.
Bone meal	15 per cent.
Salt	Balance

The Feeds Used.

Hay.—The locally-grown wheaten and oaten hays were prime, being short, fine-strawed, of good colour, cut at the flowering stage, and grown in 1929. Local oaten hay was fed until 10th February, and local wheaten hay from then until 25th May. For the remaining period oaten hay ex Temora was used. This sample was of only fair quality, being coarse in the straw, having been too mature when cut.

Maize.—This was good quality yellow feed maize, some of which was purchased in Sydney, and some from Grafton Experiment Farm. The sheep ate it readily.

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* Report of an investigation arranged by a committee consisting of Messrs. A. H. E. McDonald, Director of Agriculture; Max Henry, Chief Veterinary Surgeon; E. A. Southee, Principal, Hawkesbury Agricultural College; and E. A. Elliott, Sheep and Wool Expert.

Rice.—This was paddy rice grown on the Murrumbidgee Irrigation Area, and was eaten readily by the sheep.

Concentrate No. 1.—This nut crumbles too readily, and a small portion was thus lost daily, although, as with all the concentrates, it was fed on old bran bags spread on the ground. The nut proved unpalatable, and frequently it was late afternoon before it was consumed, although fed in the morning. Further evidence of its unpalatability was the fact that it was never consumed until after the hay had been cleaned up, whereas all other concentrates were consumed as soon as fed, and before the hay portion was fed out. It is considered that only extreme hunger forced the sheep to eat this nut, and that, owing to its unpalatability and crumbly nature, it would prove unsatisfactory as a paddock feed in drought time.

Concentrate No. 2.—The nuts proved very palatable. There was very little waste, and even this could be still further reduced by the manufacture of a nut more uniform in size and as large as, say, the largest portions. Being fed on bags, even the smallest portions were picked up, but when broadcast under paddock conditions many of these would be lost.

Concentrate No. 3.—This nut was equal in palatability to Concentrate No. 2, and of a handy, uniform size. A little crumbling was noted, but the waste was negligible.

Concentrate No. 4.—These nuts proved palatable, and were of a suitable uniform size. They did not crumble and waste was negligible.

The Amounts Consumed.

The following table shows the average amounts of foodstuffs consumed monthly per sheep in each group.

MONTHLY Quantities of Feeds and Lick Consumed per Sheep.

	Group 1.		Group 2.			Group 3.			Group 4			Group 5.		
	Hay.	Lick.	Hay.	Maize.	Lick.	Hay	Concentrate No. 1	Lick.	Hay.	Concentrate No. 2.	Lick.	Hay.	Concentrate No. 3.	Lick.
	lb.	lb.	lb.	oz.	lb.	lb.	oz.	lb.	lb.	oz.	lb.	lb.	oz.	lb.
1929.														
November . .	30·0	1·05	15·0	120 0	2·3	30·0	108·6	2·3	30·0	119·6	·4	30·0	118·8	1·5
December ..	30·8	...	15·35	120·0	...	30·9	120·0	...	30·85	120·0	...	30·8	120·0	...
1930.														
January ...	31·0	...	15·5	120·0	...	31·0	120·0	...	31·0	120·0	...	31·0	120·0	...
February ...	28·0	1·35	14·0	120·0	2·01	28·0	120·0	1·2	28·0	120·0	·8	28·0	120·0	1·8
March ...	31·0	1·0	15·5	120·0	1·2	31·0	114·0	1·2	31·0	120·0	·55	31·0	120·0	·55
April	30·0	...	15·0	120·0	...	30 0	120·0	...	30·0	120·0	...	30·0	120·0	...
May	31·0	...	15·5	120·0	...	31·0	120·0	...	31·0	120·0	...	31·0	120·0	...
June	28·5	...	13·5	120·0	...	28·5	*100·0	...	28·5	120·0	...	28·5	120·0	...
July ... ... (1st to 28th)	26·6	1·2	12·6	112·0	1·1	26·6	†100·0	1·3	26·6	112·0	·8	26·6	112·0	1·4
Totals ...	266·9	...	131·95	lb. 67	...	267·0	lb. 63·91	...	266·95	lb. 66·97	...	266·9	lb. 66·92	...

MONTHLY Quantities of Feeds and Lick Consumed per Sheep—*continued.*

	Group 6.			Group 7.				Group 8.			Group 9.		
	Hay.	Concentrate No. 4.	Lick.	Hay.	Concentrate No. 2.	Maize.	Lick.	Hay.	Rice.	Lick.	Hay.	Maize.	Lick.
	lb.	oz.	lb	lb.	oz.	oz.	lb.	lb.	oz.	lb.	lb.	oz.	lb.
1929													
November ..	30·0	118·8	1·8	30·0	59·6	60·0	·4	30·0	120·0	·55	30·0	120·0	·55
December	30·9	120·0	...	30·8	60·0	60·0	...	30·85	120·0	...	30·8	120·0	...
1930													
January ...	31·0	120·0	...	31·0	60·0	60·0	...	31·0	120·0	..	31·0	120·0	...
February ...	28·0	120·0	·8	28·0	60·0	60·0	1·0	28·0	120·0	·30	28·0	120·0	·8
March .	31·0	120·0	·6	31·0	60·0	60·0	·35	31·0	120·0	·15	30·9	120·0	·6
April . .	30·0	120·0	...	30·0	60·0	60·0	...	30·0	120·0	...	30·0	120·0	...
May	31·0	120·0	...	31·0	60·0	60·0	...	31·0	120·0	.	31·0	120·0	...
June	28·5	120·0	...	28·5	60·0	60·0	...	28·5	120 0	. .	28·5	120·0	...
July .. ... (1st to 28th).	26·6	112·0	1·3	26·6	56·0	56·0	1·05*	26·6†	112·0	·80	26·6	112·0	·95
		lb.			lb.	lb.			lb.			lb.	
Totals ...	267·0	66·92	. .	266·9	33·4	33·5	...	266·95	67	.	266·8	67	...

* Concentrate No. 1, fed for 25 days only this month.

† Another concentrate, fed for 25 days this month as substitute for Concentrate No. 1

The Cost of Feeding.

The following table shows the cost of feeding per head of each group for twelve months based on the actual amounts consumed, and as there was a percentage of waste, the cost calculated on the amount of feed distributed. The value of wool per head is also shown.

COST of Feeding for Twelve Months, and Wool Values.

Group.	Average Annual Consumption per Sheep.	Value of Feed.	Cost per Head of Feed Consumed.		Average Annual Distribution per Sheep	Cost of Feed Distributed per Sheep.		Value of Wool per Head
	lb.		s. d.	s. d.	lb.	s d.	s. d.	s d.
1	360 Hay ...	£3 10s. per ton*	...	11 3	365 Hay	...	11 10	4 4½
2	177 Hay ...	£3 10s. per ton*	5 6	14 4	182·5 Hay	5 11	14 10	5 8
	90 Maize ...	5s. 6d. per bus.	8 10		91·25 Maize	8 11		
3	360 Hay ...	£3 10s. per ton*	11 3	22 5	365 Hay	11 10	23 0	6 2¾
	86 Concentrate No. 1	£13 per ton† ...	11 2		86 Concentrate No. 1.	11 2		
4	360 Hay ...	£3 10s. per ton*	11 3	24 9	365 Hay	11 10	25 6	4 9½
	90 Concentrate No. 2	£15 per ton† ...	13 6		91·25 Concentrate No. 2.	13 8		
5	360 Hay ...	£3 10s. per ton*	11 3	21 2	365 Hay	11 10	22 2	4 9
	90 Concentrate No. 3	£11 per ton† ...	9 11		91·25 Concentrate No. 3.	10 4		
6	360 Hay ...	£3 10s. per ton*	11 3	23 5	365 Hay	11 10	24 1	6 1
	90 Concentrate No. 4	£13 10s. per ton†	12 2		91·25 Concentrate No. 4.	12 3		
7	360 Hay ...	£3 10s. per ton*	11 3	22 5	365 Hay	11 10	23 2	6 8
	45 Maize ...	5s. 6d. per bus.	4 5		45·12 Concentrate No. 2.	6 10		
	45 Concentrate No. 2	£15 per ton† ...	6 9		45·12 Maize	4 6		
8	360 Hay ...	£3 10s. per ton*	11 3	17 3	365 Hay	11 10	17 11	5 7½
	90 Rice ...	£7 10s. per ton*	6 0		91·25 Rice	6 1		
9	360 Hay ...	£3 10s. per ton*	11 3	20 1	365 Hay	11 10	20 9	6 4½
	90 Maize ...	5s. 6d. per bus.	8 10		91·25 Maize	8 11		

* 2,240 lb. † 2,000 lb.

Losses in Weight During Trial.

The following table shows the losses in weight which occurred during the trial.

Group and Sheep No.		Weight at beginning (1st Nov., 1929).	*Weight at end (28th July, 1930).	Individual loss or gain during trial.	Average group loss per sheep during trial.
		lb.	lb.	lb.	lb.
1	1	78	52½	−25½	24·5
	2	80	46½	−33½	
	3	78	55½	−22½	
	4	79	58½	−20½	
	5	79	58½	−20½	
2	6	77	47½	−29½	21·2
	7	76	52½	−23½	
	8	76	55½	−20½	
	9	76	65	−11	
	10	76	54½	−21½	
3	11	86	72½	−13½	19·25
	12	91	65¾	−25¼	
	13	84	62	−22	
	14	84	59	−25	
	15	87	76½	−10½	
4	16	68	54½	−13½	10·05
	17	69	68¾	−¼	
	18	69	65¼	−3¾	
	19	69	48¼	−20¾	
	20	68	56	−12	
5	21	87	71½	−15½	10·8
	22	80	70	−10	
	23	80	66½	−13½	
	24	80	80	Nil.	
	25	80	65	−15	
6	26	81	60½	−20½	15·7
	27	82	61½	−20½	
	28	83	82	−1	
	29	84	64½	−19½	
	30	83	66	−17	
7	31	76	61	−15	13
	32	76	57½	−18½	
	33	75	68	−7	
	34	74	66	−8	
	35	74	57½	−16½	
8	36	72	71½	−½	9·6
	37	70	57½	−12½	
	38	72	60	−12	
	39	72	57	−15	
	40	67	59	−8	
9	41	73	66½	−6½	6·8
	42	72	71½	−½	
	43	73	55	−18	
	44	73	76½	+3½	
	45	73	60½	−12½	

* Shearing took place on 21st July, and the sheep were finally weighed on 28th July. For the purpose of this table the fleece weights have been added to the body weights recorded on 28th July.

Feed Consumed in Relation to Weight.

In the following table the loss or gain in the weight of each sheep and in the average weight of the group at the end of each month is shown beside the average amount of feed consumed per sheep per day during the month.

FEED Consumed per Head per Day and Monthly Loss or Gain in Weight per Head and Average per Group.

Month.	Group.	Average Amount of Feed and Lick consumed per Sheep per Day each month.								Monthly Loss or Gain in Weight.					
		Hay.	Maize.	Concentrate No. 1.	Concentrate No. 2.	Concentrate No. 3.	Concentrate No. 4.	Rice.	Lick.†	Individual Sheep.					Group Average.
		lb.	oz.	oz.	oz.	oz.	oz.	oz.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
November, 1929.	1	1	...	...	...	...	...	...	·037	− 6	− 8	− 7·5	− 7·5	− 2	− 6·2
	2	·5	4	...	...	...	...	...	·082	−14·5	−10	− 9	− 6	− 4	− 8·7
	3	1	...	3·62	...	...	...	...	·082	− 5	− 8·5	− 11·5	− 4	− 7	− 7·2
	4	1	...	...	3·98	...	...	...	·014	− 9	− 2·5	− 3·5	− 5	− 8	− 5·6
	5	1	...	...	...	3·96	...	...	·053	− 11	− 8	− 8·5	− 2	− 8	− 7·5
	6	1	...	...	...	...	3·96	...	·064	−14·5	−14	− 3	− 5	−11·5	−10·2
	7	1	2	...	1·9	...	...	...	·014	− 6	− 2·5	− 4	− 7·5	− 1·5	− 4·3
	8	1	...	...	...	...	...	4	·019	− 5	− 2	− 4·5	− 4·5	− ·5	− 3·3
	9	1	4	...	...	...	...	...	·019	− 6	− 5	− 6	− 3	− 5·5	− 5·1
December, 1929.	1	·993	...	...	...	...	...	...	...	− 5·5	− 9·5	− 3·5	− 4·5	− 3	− 5·2
	2	·495	4	...	...	...	...	...	...	− 7·5	− 4	− 3	0	− 4	− 3·7
	3	·996	...	4	...	...	...	...	...	+ 1	− 3·5	+ ·5	− 6	0	− 1·6
	4	·995	...	...	4	...	...	...		+ 4	+ 1·5	− 1·5	− 1	+ 3	+ 1·2
	5	·993	...	...	...	4	...	...	Rain.	0	+ 2	+ 1	+ 2	+ 2	+ 1·4
	6	·996	...	...	...	...	4	...		+ 2·5	+ 4	− 1	− 1	+ 2·5	+ 1·4
	7	·993	2	...	2	...	...	...	...	0	− ·5	+ ·5	− 1·5	− 1·5	− ·6
	8	·995	...	...	...	...	...	4	...	+ 2	− 3	+ 3·5	− 4·5	− 1·5	− ·7
	9	·993	4	...	...	...	...	...	...	+ 2	+ 3	− 1	+ 2	− 1	+ 1
January, 1930.	1	1	...	...	...	...	...	...	...	− 3·5	− 3	− 2	− 1	− 3·5	− 2·6
	2	·5	4	...	...	...	...	...	...	0	− 1·5	− 2	− 2·5	− 4·5	− 2·1
	3	1	...	4	...	...	...	...	...	− 1·5	+ 2	− 1	− 4	+ ·5	− ·8
	4	1	...	...	4	...	...	...		− 2·5	− ·5	+ 1·5	− 2·5	− 2·5	− 1·3
	5	1	...	...	...	4	...	...	Rain.	+ 2·5	− 1·5	− 4	− 2	0	− 1
	6	1	...	...	...	...	4	...		+ 2	0	+ 2	− 4	− ·5	− ·1
	7	1	2	...	2	...	...	...	...	+ 1	0	− 1·5	+ 1·5	− 2·5	− ·3
	8	1	...	...	...	...	...	4	...	− ·5	− 2·5	− 5	− 5	− 1	− 2·8
	9	1	4	...	...	...	...	...	...	− 3·5	+ 1·5	− 1·5	+ 1	+ 2	− ·1
*February.	1	1	...	...	...	...	...	...	·048	0	+ ·5	+ 1	+ 2·5	+ 5·5	+ 1·9
	2	·5	4	...	...	...	...	...	·072	− 3	+ 1·5	+ 1	+ ·5	+ 3·5	+ ·7
	3	1	...	4	...	...	...	...	·042	+ 4	+ 1	+ 4	+ 3·5	+ 2	+ 2·9
	4	1	...	...	4	...	...	...	·028	+ 3·5	+ 3	+ 2	+ 2·5	+ 2·5	+ 2·7
	5	1	...	...	...	4	...	...	·064	+ 2·5	+ 3	+ 5·5	+ 2	+ 5	+ 3·6
	6	1	...	...	...	...	4	...	·028	+ 7	+ 2	− 3	+ 1·5	+ 1·5	+ 1·8
	7	1	2	...	2	...	...	...	·035	+ 3	+ 3	+ 2	+ 1	+ 3	+ 2·4
	8	1	...	...	...	...	...	4	·010	+ 3	+ 7	+ 4	+ 5·5	+ 4	+ 4·7
	9	1	4	...	...	...	...	...	·028	+ 5	+ 2·5	+ 4·5	+ 1·5	+ 1·5	+ 3
†March.	1	1	...	...	...	...	...	...	·035	+ 3	− 7	− ·5	− 1	− 5·5	− 2·2
	2	·5	4	...	...	...	...	...	·042	+ 1	− 3·5	+ 2	− ·5	− ·5	− ·3
	3	1	...	3·80	...	...	...	...	·042	− 2	0	− 1	− 2·5	+ 1·5	− ·8
	4	1	...	...	4	...	...	...	·019	+ 1	+ 1	+ 2	+ 1	+ 1	+ 1·2
	5	1	...	...	...	4	...	...	·033	− ·5	+ ·5	0	+ 2	+ ·5	+ ·5
	6	1	...	...	...	...	4	...	·021	− 4	− ·5	+ 5	+ 3	+ 2	+ 1·1
	7	1	2	...	2	...	...	...	·012	− 2	+ 2·5	+ 2·5	+ 3·5	− 1·5	+ 1
	8	1	...	...	...	...	...	4	·005	+ 1	− 2·5	− 2	− ·5	− 2	− 1·1
	9	·996	4	...	...	...	...	...	·021	− 4	− ·5	− 1	+ 4	− 3	− ·9
April.	1	1	...	...	...	...	...	...	...	− 4·5	+ 2	− 3	− 2·5	− 1·5	− 1·9
	2	·5	4	...	...	...	...	...	...	− ·5	− ·5	− ·5	− 3·5	− 1	− 1·1
	3	1	...	4	...	...	...	...	...	0	− 3·5	− 1	0	− ·5	− 1
	4	1	...	...	4	...	...	...		+ 1	0	− 2	0	− 1·5	− ·5
	5	1	...	...	...	4	...	...		− 4·5	− 1·5	− 2	0	− 4	− 2·4
	6	1	...	...	...	...	4	...	Rain.	− 3	− 3	− ·5	− 3	− 3·5	− 2·6
	7	1	2	...	2	...	...	...	...	− 2	− 2·5	− 1·5	− 1	+ 2	− 1
	8	1	...	...	...	...	...	4	...	− 1·5	− 1·5	− 3	+ ·5	− ·5	− 1·2
	9	1	4	...	...	...	...	...	...	+ ·5	− 1	− 2	− 1	− 1·5	− 1

FEED Consumed per Head per Day and Monthly Loss or Gain in Weight per Head and Average per Group—*continued.*

Month.	Group.	Average Amount of Feed and Lick consumed per Sheep per Day each month.								Monthly Loss or Gain in Weight.					
		Hay.	Maize.	Concentrate No. 1.	Concentrate No. 2.	Concentrate No. 3.	Concentrate No. 4.	Rice.	Lick.	Individual Sheep.					Group Average.
		lb.	oz.	oz.	oz.	oz.	oz.	oz.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
‡May.	1	1	...	...	...	...	...	...	...	0	− 1	− 1·5	+ 1	+ 2	+ ·1
	2	·5	4	...	...	...	...	...	...	0	+ 1·5	0	+ 2	− ·5	+ ·6
	3	1	...	4	...	...	...	...	...	0	+ 2	+ 2	0	+ 4	+ 1·6
	4	1	...	...	4	...	...	...	Rain.	− 1	+ 1·5	− ·5	− 2·5	− ·5	− ·6
	5	1	...	...	...	4	...	...		− 4	+ 1	− 3	+ 1·5	+ ·5	− ·8
	6	1	...	...	...	...	4	...		+ 1	0	+ 1	− ·5	+ ·5	− ·4
	7	1	2	...	2	...	...	...	...	+ 2·5	− 2·5	0	− ·5	− ·5	− ·2
	8	1	...	...	...	...	...	4	...	+ 1·5	− ·5	+ 2	− ·5	+ ·5	+ ·6
	9	1	4	...	...	...	...	...	...	+ 3·5	+ 1·5	+ ·5	+ 1	− ·5	+ 1·2
§¶June.	1	·943	...	...	...	...	...	...	...	− 5	− 3	− 1	− 4	− 5·5	− 3·7
	2	·443	4	...	...	...	...	...	...	− 8	− 5	− 7	− 5	− 6	− 6·2
	3	·943	...	3·3	...	...	...	...	...	− 9	− 6·5	− 6	− 9·5	− 7·5	− 7·7
	4	·943	...	...	4	...	...	...	Rain.	− 3·5	− 1	+ 2	+ 1	− 3	− ·9
	5	·943	...	...	...	4	...	...		+ 3·5	− 3	0	− 1·5	− 6	− 1·4
	6	·943	...	...	...	...	4	...		− 1·5	− 1·5	+ 1·5	− 4	− 1	− 1·3
	7	·943	2	...	2	...	...	...	...	− 2·5	− 5	0	− 1	− 2·5	− 2·2
	8	·943	...	...	...	...	...	4	...	0	− 3	− 4	− 1·5	− 4	− 2·5
	9	·943	4	...	...	...	...	...	...	− 3	− 1	− 3	+ 1·5	− 2	− 1·5
**†† July 1st to 28th.	1	·95	...	...	...	...	...	...	·042	− 4	− 4·5	− 3·5	− 3·5	− 7	− 4·5
	2	·45	4	...	...	...	...	...	·039	+ 3	− 2	− 2	+ 4	− 4·5	− ·3
	3	·95	...	3·57	...	...	...	...	·046	− 1	− 7·25	− 8	− 2·5	− 3·5	− 4·65
	4	·95	...	...	4	...	...	...	·028	− 7	− 3·25	− 3·75	−14·25	− 3	− 6·25
	5	·95	...	...	...	4	...	...	·05	− 4	− 2	− 2·5	− 2	− 1	− 2·25
	6	·95	...	...	...	...	4	...	·046	−10	− 7·5	− 3	− 6·5	− 4	− 6·2
	7	·95	2	...	2	...	...	...	·037	− 9	−11	− 5	− 2·5	− 1·5	− 5·8
	8	·95	...	...	...	...	...	4	·028	− 1	− 3·5	− 4	− 4·5	− 3	− 3·2
	9	·95	4	...	...	...	...	...	·033	− 1	− 1·5	− 8·5	− 3·5	− 2·5	− 3·4

|| Lick consumption is calculated on a basis of twenty-eight days per month, as weighings were taken every seven days. Only four months' figures are included, those of the remaining months being inaccurate owing to rain entering the containers.

* Local oaten hay supply exhausted and local wheaten hay fed from 10th February.

† All sheep were drenched with copper sulphate and mustard on 5th and 19th March owing to the faeces showing worm infestation.

‡ Local wheaten hay supply exhausted and oaten hay ex-Temora (only a fair sample; too mature) fed from 20th May.

§ Concentrate No. 1 fed only for twenty-five days in June, owing to the supply being exhausted and the new supply not to hand.

¶ A very small quantity (estimated at ¼ lb.) of hay was left daily by all groups—*i.e.*, portion of the coarse straw. In addition, approximately 1 lb. was left by all groups on one day, due to it being stamped and fouled by mud.

** No concentrate was fed to Group No. 3 until 4th July, and from that date another concentrate was substituted for Concentrate No. 1.

†† A very small quantity (estimated at ¼ lb.) of hay was left daily by all groups—*i.e.*, portion of the coarse straw.

Condition of the Sheep at Conclusion of Trial.

In all groups the sheep were in strong healthy condition, there being no great difference in the appearance of Groups 3, 4, 5, 6, 7, 8, and 9, while 1 and 2 were in a poorer state, yet strong, with No. 2 slightly inferior to No. 1.

Conclusions on the Field Trials.

The outstanding fact demonstrated by the trial is that good quality cereal hay is the most satisfactory drought fodder when procurable at a cost not exceeding £4 per ton. From the cost standpoint it easily holds first place.

Further, it was demonstrated that the expense incurred by adding concentrates to a ration of 1 lb. of good cereal hay is not commensurate with the slightly better condition maintained by sheep on rations containing concentrates. More particularly does this apply when sheep and wool values are low, as at the present time.

The condition of Groups 8 and 9 proved rice and maize to be equal in feeding value to any of the proprietary concentrates fed, and considerably cheaper, notably rice. Rice cost 2s. 10d. per head less than maize, and maize cost 1s. 1d. less per head than the cheapest concentrate (No. 3).

Judging by the condition of Group 2, which was slightly inferior to Group 1, 1 lb. hay is necessary to provide a sheep with sufficient bulky feed when the paddocks are bare of roughage.

Because of its unpalatability and crumbly nature, Concentrate No. 1 is considered unsuitable and uneconomical as a sheep feed.

Health Notes.

The District Veterinary Officer (West), Mr. H. G. Belschner, B.V.Sc., made observations on the sheep as regards their health during the trial, and examinations of faeces were carried out to determine whether they were affected with parasites or not. He first inspected them in February, and then reported that lots 1, 2, and 4 were somewhat anaemic, and were not doing as well as the other lots. It was thought that possibly worm infestation was the cause, but on examination being made it was not found that these lots were affected beyond the others to any marked degree, if at all. It was considered that at that time lots 5, 8, and 9 were in the best health, judging from visual inspection. It was noted that stomach worm was present in fair numbers, and, therefore, arrangements were made to drench all the sheep twice with copper sulphate and mustard. It was satisfactory to note that no oesophagostomes, which cause the troublesome "pimply gut" were found in the samples submitted, nor were any detected throughout the trial. All the sheep, however, had coccidiosis, but that is so common in our sheep, that it has probably no pathological significance.

From observations made in May the District Veterinary Officer advised that at that time lots 1 and 2 were the worst in appearance. The sheep in Group 9 compared favourably with any other, which is not surprising considering the ration. At the third inspection in August no definite evidence of ill health was observed, except that certain groups, particularly Nos. 1 and 2, were suffering from malnutrition.

The Wool Aspect.

The following notes on the wool from the sheep were supplied by Mr. E. A. Elliott, Sheep and Wool Expert.

The wool of the sheep was inspected on 1st September, two wool valuers kindly assisting in the examination. All fleeces were slightly burry.

Lot 1.—Three of the fleeces were hungry—fine and slightly tender. They showed lack of body and evidence of semi-starvation. The other fleeces were better-grown and more bulky, seeming to indicate that they had received a larger share of the food. All the fleeces were deficient in length.

Yield, 53 per cent.; valuation, 11d.; weight of fleece, 4⅘ lb.; value per head, 4s. 4⅘d.

Lot 2.—All rather short, wefty, fine and soft; one slightly weak. An even lot and attractive " buyers' wool."

Yield, 54 per cent.; valuation, 12·42d.; weight of fleece, 5½ lb.; value per head, 5s. 8d.

Lot 3.—All but one fair length, only one slightly tender, 64s quality, well nourished and well grown except one fleece.

Yield, 53 per cent.; valuation, 11½d.; weight of fleece, 6½ lb.; value per head, 6s. 2¾d.

Lot 4.—All but one well grown and well nourished with good length. More condition than Lot 3.

Yield, 49 per cent.; valuation, 10¼d.; weight of fleece, 5⅗ lb.; value per head, 4s. 9½d.

Lot 5.—All sound, well grown with fair length—one a little thin. No so well nourished as Lots 3 or 4. Soft and attractive in texture, &c.

Yield, 51 per cent.; valuation, 10·20d.; weight of fleece, 5⅗lb., value per head, 4s. 9d.

Lot 6.—Sound, well nourished, fair length, fine and soft handling.

Yield, 51 per cent.; valuation, 10¾d.; weight of fleece, 6⅕ lb.; value per head, 6s. 1d.

Lot 7.—Good quality, and colour, 64s, particularly nice line, well nourished and good length. Best commercial growers' wool.

Yield, 52 per cent.; valuation, 11·44d.; weight of fleece, 7lb.; value per head, 6s. 8d.

Lot 8.—Sound and attractive except one, which was a little thin; good condition.

Yield, 51 per cent.; valuation, 11¼d.; weight of fleece, 6 lb.; value per head, 5s. 7½d.

Lot 9.—Not so well grown as Lot 7. Rather plain and deficient in length for its quality; good condition, slightly discoloured.

Yield, 51 per cent.; valuation, 11½d.; weight of fleece, 6⅘ lb.; value per head, 6s. 4½d.

Conclusions from the Wool viewpoint.—Although the return per head was the lowest in Lot 1, it is very satisfactory to know that 1 lb. hay will grow such a saleable type of wool.

Lot 2 attracted the attention of the wool valuers because of its suitability to the wool trade, being light, fine and rather short, but it was noticeably underfed and short, indicating the need for increased bulk in the ration.

The trial indicates differences between proprietary nuts, and although Concentrate No. 1 proved very unsatisfactory in feeding on account of its crumbly nature and was not eaten readily, the results from the wool was better than from the other concentrates. Taking concentrates only and comparing the average weight of wool per head, No. 1 was second, and it gave the best return per head.

Concentrate No. 4 in Lot 6 proved very satisfactory; the weight per head was very good, better than the other concentrates, and the wool was very attractive with a satisfactory return per head.

Lot 7 gave the most attractive wool from a commercial standpoint, but this was only to be expected as it should have been nearest to a complete ration.

The result from rice feeding was very satisfactory, though the fleece weight was lower than from some of the other rations. The cost of feeding, however, was much lower than most of the other rations.

The trial shows that maize will give better results than the proprietary feeds on the market, and at a lower cost.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1931.

Wentworth (W. B. Crang) ...	July	15
Forbes Sheep Show (E. A. Austen)	,,	15, 16
Cootamundra Sheep Show (G. B. Black)	,,	21, 22
Young Sheep Show (Thos. A. Tester)	,,	29, 30
Peak Hill (W. Crush)	Aug.	18, 19
Lake Cargelligo (C. W. Hutchens)	,,	18, 19
Gilgandra	,,	18, 19
Illabo (J. McCarthy)	,,	19
Condobolin (J. M. Cooney) ...	,,	25, 26
Grenfell (J. M. McInnes) ...	,,	25, 26
Ungarie (D. R. Bedford) ...	,,	26
Wagga (F. H. Croaker)	,,	25, 26, 27
West Wyalong (A. Andrew) ...	Sept.	1, 2
Murrumburrah (W. Worner) ...	,,	1, 2
Parkes (L. S. Seaborn)... ...	,,	1, 2
Burrowa (S. G. Hughston) ...	,,	8, 4
Corowa (H. G. Norton)	Sept.	4, 5
Barmedman (S. S. Penberthy)	,,	5
Young (Thos. A. Tester) ...	,,	8, 9
Forbes (E. A. Austen)	,,	8, 9
Cowra (E. P. Todhunter) ...	,,	15, 16
Temora (J. M. McInnes) ...	,,	15, 16
Junee (G. W. Scrivener) ...	,,	22, 23
Canowindra (W. E. Frost) ...	,,	22, 23
Barellan (W. H. McRae) ...	,,	23
Ardlethan (Les Smith)	,,	30
Berrigan (R. Wardrop)	,,	30
Hay (G. C. McCracken)	,,	30, Oct. 1
Narrandera (J. D. Newth) ...	Oct.	6, 7
Ariah Park (Mort Collings) ...	,,	7
Quandialla (Stuart Tomkins) ...	,,	7
Griffith (M. E. Sellin)	,,	13, 14
Bribbaree (J. Aston)	,,	14
Cootamundra (G. B. Black) ...	,,	20, 21

INFECTIOUS DISEASES REPORTED IN MAY.

THE following outbreaks of the more important infectious diseases wer reported during the month of May, 1931:—

Anthrax	Nil.
Blackleg	5
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	6
Swine fever	Nil.
Contagious pneumonia	3
Necrotic enteritis	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

TUBERCLE-FREE HERDS.

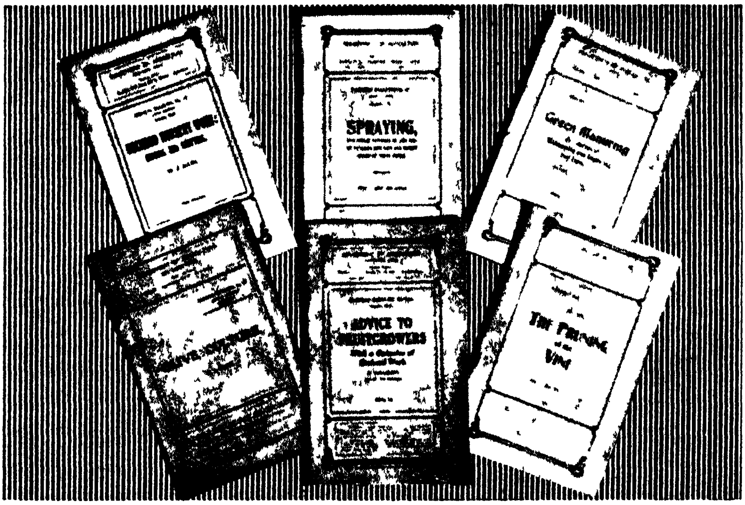
OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tucercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Department of Education, Gosford Farm Homes	30	3 July, 1931
F. C. Kershaw, Macquarie House, Macquarie Fields	71	5 „ 1931
P. Ubrihien Corridgeree, Bega	114	6 „ 1931
William Thompson Masonic School, Baulkham Hills	48	13 „ 1931
J. F. Dowe, "Woolomol," Tamworth	59	19 „ 1931
A. L. Logue, Thornbro, Muswellbrook	40	23 „ 1931
Gladesville Mental Hospital	42	25 „ 1931
A. H. Webb, Quarry-road, Ryde	6	26 „ 1931
A. Shaw, Barrington (Milking Shorthorns)	122	9 Aug., 1931
E. P. Perry, Nundorah, Parkville (Guernseys)	22	13 „ 1931
Wagga Experiment Farm (Jerseys)	55	14 „ 1931
Sacred Heart Convent, Bowral	12	20 „ 1931
St. Patrick's College, Goulburn	8	22 „ 1931
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	46	22 „ 1931
James McCormack, Tumut	111	29 „ 1931
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	81	12 Sept., 1931
S. L. Wills, Greendale Dairy, Cowra	37	19 „ 1931
Wolaroi College, Orange	10	4 Oct., 1931
Riverstone Meat Co., Riverstone Meat Works, Riverstone	104	11 „ 1931
E. S. Cameron, Big Plain, Narrandera	28	14 „ 1931
J. L. W. Barton, Wallerawang	17	17 „ 1931
Newington State Hospital and Home	108	24 „ 1931
J. F. Chaffey, Glen Innes (Ayrshires)	75	4 Nov., 1931
Lunacy Department, Callan Park Mental Hospital	29	13 „ 1931
J. Davies, Puen Buen, Scone (Jerseys)	85	14 „ 1931
Wollongbar Experiment Farm, Lismore (Guernseys)	129	21 „ 1931
Tamworth District Hospital	7	24 „ 1931
Department of Education, Brush Farm, Eastwood	6	9 Dec., 1931
Bathurst Experiment Farm (Jerseys)	21	16 „ 1931
H. A. Corderoy, Wyuna Park, Comboyne (Guernseys)	59	8 Jan., 1932
New England Girls' Grammar School, Armidale	29	10 „ 1932
C. J. Parbery, Allawah, Bega	119	10 „ 1932
New England Experiment Farm, Glen Innes (Ayrshires)	37	12 „ 1932
W. Spindler, Mt. Pleasant, Bega	66	15 „ 1932
D. T. Herbert, Racecourse Farm, Bega	68	18 „ 1932
R. C. Dickson, Elwaton, Castle Hill (Jerseys)	17	20 „ 1932
Lunacy Department, Morisset Mental Hospital	22	23 „ 1932
Lidcombe State Hospital and Home	146	11 Feb., 1932
Riverina Welfare Farm, Yanco	77	25 „ 1932
Department of Education, Yanco Agricultural High School	33	26 „ 1932
W. M. McLean, Five Islands Road, Unanderra	78	27 „ 1932
Mittagong Farm Homes	46	3 Mar., 1932
George Rose, Aylmerton	4	4 „ 1932
Kinross Bros., Minnamurra, Inverell (Guernseys)	66	5 „ 1932
P. M. Burtenshaw, Killean, Inverell	50	5 „ 1932
Miss Brennan, Arankamp, Bowral	10	6 „ 1932
Kyong School, Moss Vale	4	12 „ 1932
G. A. Parish, Jerseyland, Berry	123	13 „ 1932
Lunacy Department, Parramatta Mental Hospital	33	16 „ 1932
Cowra Experiment Farm	32	24 „ 1932
Hawkesbury Agricultural College (Jerseys)	115	25 „ 1932
Russell Lamrock, Orange	4	26 „ 1932
St. Joseph's Convent, Reynold-street, Goulburn	3	26 „ 1932
St. John's Boys Orphanage, Goulburn	9	26 „ 1932
Marion Hill Convent of Mercy, Goulburn	9	26 „ 1932
Lunacy Department, Kenmore Mental Hospital	79	27 „ 1932
St. Joseph's Girls Orphanage, Kenmore	9	27 „ 1932
J. P. McQuillan, Bethungra Hotel, Bethungra	14	1 April, 1932
St. Michael's Novitiate, Goulburn	5	26 „ 1932
James Wilkins. Jerseyville, Muswellbrook	39	28 „ 1932
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	195	29 „ 1932
Tudor House School, Moss Vale	8	3 May, 1932
Australian Missionary College, Cooranbong	58	6 „ 1932
Navua Ltd., Grose Wold, via Richmond (Jerseys)	16	13 „ 1932
E. C. Nicholson, Jillamatong, Corowa	184	2 June, 1932
Grafton Experiment Farm (Ayrshires)	194	4 „ 1932

—MAX HENRY, Chief Veterinary Surgeon.

DEPARTMENT OF AGRICULTURE,
NEW SOUTH WALES.

FRUIT GROWERS !!



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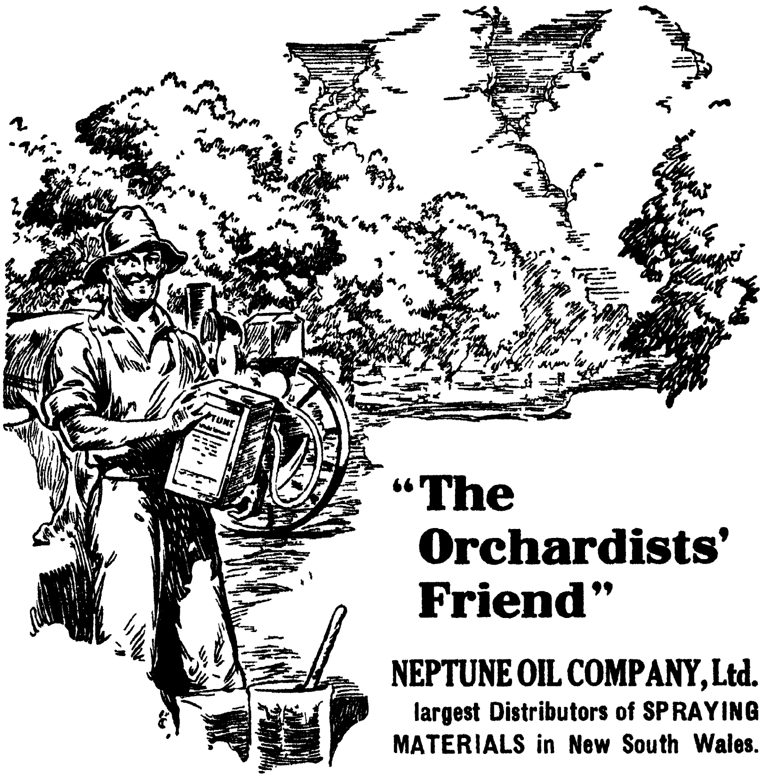

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Orchard Notes.

JULY.

C. G. SAVAGE and W. LE GAY BRERETON.

In many deciduous orchards, especially in the inland and tableland districts, pruning will still be one of the chief operations during this month. The frequent occurrence of wet weather since the autumn has delayed pruning and made it all the more important to push this work along whenever fine weather prevails and the land is dry enough to get on. Late pruning is to be avoided as it clashes with so many other jobs, such as spraying, that must be carried out during the late winter and early spring.

The orchard burner is coming into more general use, and it is a far quicker method of disposing of prunings than carting them away.

A leaflet on pruning deciduous fruit trees is obtainable free from the Department of Agriculture (Box 36A, G.P.O., Sydney), and also a fully illustrated book which deals with the subject more extensively, the price of which is 3s. 4d. posted.

Ploughing.

Though it is better, where possible, to complete pruning before commencing to plough, the latter should not be delayed beyond a certain period, even if pruning is not completed.

If the land did not receive an autumn ploughing, or if it is carrying a green manure crop or a volunteer crop of weeds, the ploughing should be completed and all growth turned under not later than the end of July. An earlier completion is preferable, and where deciduous trees, such as Edward VII, Rawson, and similar varieties of peaches, and some of the Japanese plums that start into activity early in July, are grown, a correspondingly earlier ploughing is advisable. Turning under green growth in good time allows it to rot, and the plant-foods which it has locked up become available again for the trees in the spring when they are wakening into full activity. Apart from this, ploughing in good time checks evaporation from the deeper part of the soil and allows any further rains to soak into the lower depths, to be stored for the future use of the trees.

It is not uncommon for a dry spell to occur during the spring after a wet winter, and it is remarkable how quickly soil dries out to a great depth if it has not been ploughed. Orchards generally have had a thorough soaking, and the moisture has penetrated deeply this winter, and it is now up to the grower to do his part to conserve that subsoil moisture as far as possible for the use of the trees later.

Where the orchard has had an autumn ploughing and the land has not become compacted or weed infested, it is preferable to delay the ploughing till later. Though under these conditions the second ploughing can sometimes be delayed till well into the spring with advantage, a careful watch should be kept on the land and ploughing carried out as soon as it appears necessary.

The Application of Fertiliser.

Where it has been found beneficial to manure deciduous trees, fertilisers such as bonedust, blood and bone or superphosphate can be applied and ploughed in during the July ploughing. Quick-acting nitrogenous fertilisers, such as nitrate of soda or sulphate of ammonia, should not be applied till shortly before the trees start into activity in the spring; if applied too early there is a risk of loss of nitrogen.

Any farmyard manure available can be ploughed in during July or earlier ploughings. Farmyard manure and other bulky organic matter such as bush rakings or a green crop, besides adding humus to the soil, have another advantage when ploughed in during the early part of the winter. The nitrifying bacteria which assist in the decay of organic matter make use of the available nitrates in the soil, thus preventing loss of nitrogen by leaching during wet periods in the winter, and provided the decay of the organic matter is complete before the spring, this locked up nitrogen is then again in an available form for the trees.

Cherry Black Aphis.

This pest was not nearly so prevalent last season as it has been in some previous years, and consequently some growers will be inclined to forget the loss it can cause. A careful watch should be kept upon the trees for aphid eggs when spring is approaching, and if such are found, especially just at the base of the buds, the trees should be sprayed with miscible oil (1 part to 20 parts of water by volume) when the buds are well swollen. It is important to delay spraying till the eggs are hatching, but it should be carried out before the cover scales of the buds open sufficiently to give protection to the newly-hatched aphids. If growers have difficulty in identifying the cherry aphis eggs they should get in touch with their local orchard inspector.

Green Peach Aphis.

Green peach aphis also gave very little trouble last season in most of the inland districts, though it showed up in more places on the coast than hitherto.

The method of control recommended for inland districts by the Entomologist of the Department is to spray with either (1) a tar distillate spray or (2) with nicotine sulphate and soap spray.

Tar Distillate Spray has only recently come on to the market here, but several different brands are now available. These sprays should be applied to the trees when they are completely dormant and after the last of the over-wintering eggs have been laid, the object being to kill all the eggs, thus preventing any spring hatching. The period when these sprays should be applied may vary in different districts, but in the Irrigation Area is usually from about the last week in June until the middle of July. On no account should tar distillate sprays be applied when the buds are commencing to burst.

Limited tests in one season only have given excellent results with these sprays, but the correct dilution has not yet been determined. A strength of 1 in 25 caused some damage to the buds, and it is suggested that growers should not use a greater strength than 1 in 30.

Nicotine Sulphate and Soap has no effect on the eggs and should be applied after they hatch, but before the buds burst, *i.e.*, during the two or three weeks preceding bud bursting, which on the Irrigation Area would be as a rule from about the first week in August up to about the 25th of that month. The spray should be mixed at the rate of 1 part of nicotine sulphate to 600 parts of water, plus 1 lb. of soap to 25 gallons. During the last two seasons this spray has given practically complete control.

Only one spraying is necessary with either a tar distillate or a nicotine sulphate spray, provided that it is thoroughly applied with a high-pressure spray outfit at the periods indicated above.

It is only quite recently that the green peach aphis has given trouble in coastal peach districts, and it is not yet known whether the life history is the same under these conditions as it is inland. Moreover another difficulty presents itself; in our coastal districts many varieties of peach that blossom in July are grown; consequently, if the aphid eggs are not all laid before blossoming, the tar distillate treatment will not be fully effective as it can only be applied when the trees are dormant. Again, if the eggs have not hatched before the trees have started to blossom, the nicotine sulphate and soap treatment may not be very effective, as once the buds commence to open the young aphids have cover and many escape the spray.

Black Peach Aphis.

The treatment for this pest is as follows:—

Winter Treatment.—A miscible oil spray, diluted 1 part to 25 parts of water by volume, is satisfactory when the black aphid is found on the trees during the dormant period. The oil spray at this strength should not be used later than when the buds commence to swell. If lime-sulphur is to be used during the dormant period on peach and nectarine trees to control leaf curl, the lime-sulphur should be applied first and the oil three or four weeks later.

To avoid two applications when the trees are dormant a combined spray of lime-sulphur and tobacco extract may be used. When combining sprays it is important that both ingredients are in the right proportions to the total quantity of spray liquid. Tobacco extract made in accordance with instructions issued in pamphlet form by the Department may be used in place of nicotine sulphate (40 per cent.).

Spring and Summer Treatment.—Trees subject to black aphid attack should be closely watched in the spring, and immediately the aphids appear sprayed with nicotine sulphate (40 per cent.), diluted 1 part to 600 parts of water by volume (1 pint to 75 gallons water), or tobacco extract, using midrib factory refuse at the rate of 1 lb. to 2½ gallons of water. Some advantage is to be gained by adding 1 lb. soap to every 25 gallons of the nicotine sulphate spray. The aphids breed very rapidly, and it is important to spray promptly before they have multiplied to great numbers.

If any live aphids remain after the first spraying, the application should be repeated within two days, or at the longest three days. It sometimes takes three or more applications in quick succession to get this pest under control.

If aphids appear before the trees commence to blossom, an endeavour should be made to get them under control before the blossoms open and the aphids can hide within, when they are more difficult to reach with the spray.

Leaflets on the black and green peach aphids are also obtainable free from the Department of Agriculture.

San Jose Scale.

Trees affected with this scale should be sprayed with miscible red oil diluted 1 to 20 or 25 parts of water by volume while they are dormant. The Department has found that the oil spray is more efficient than lime-sulphur. When it is desired to spray peach trees for peach leaf-curl as well as for San Jose scale, they can be sprayed with full winter strength lime-sulphur or 6-4-40 Bordeaux mixture first, and about three weeks later treated with the oil spray.

If only a few isolated trees in the orchard are affected with San Jose scale it is worth while giving them a special treatment. They should be pruned separately and the prunings burned immediately in a burner at the trees. Care should be taken that the pruning tools are cleaned with kerosene before being used again on clean trees. Care should also be taken not to carry infection to clean trees on the hands and clothing. The butt of the tree if large should then be sprayed with miscible red oil diluted 1 part to 20 parts of water, earth thrown in round the butt and the tree given a heavy, thorough spraying with the miscible oil. The soil around the butt catches the spray that runs off, after which it is thrown away so that the oil does not remain about the butt of the tree and cause damage to the bark.

If this treatment is carried out early in the season, these affected trees can later, but while still dormant, be given a second normal spraying with oil diluted 1 part in 25 parts of water. At this time the immediately surrounding trees can also be sprayed, as it is probable that they will have had scale carried to them by birds, though it may not have increased enough to be easily detected.

Peach Leaf-curl.

During the early part of July is a good time to apply either Bordeaux mixture (6-4-40) or lime-sulphur (full winter strength) to peach and nectarine trees liable to peach leaf-curl, and which do not blossom till August or later; early-blossoming varieties such as Governor Rawson, &c., should, of course, be sprayed earlier.

One thorough spraying with either of these sprays before the buds have swollen in the spring has consistently given control of this disease both in extensive Departmental experiments and orchard practice. However, some growers report that they have failed to control curl with one application, and they make two; one of lime-sulphur when the trees are dormant, and the other of Bordeaux mixture (6-4-50) when the buds are well swollen or slightly showing colour.

Vine Diseases.

Mr. G. W. Beverley, Senior Fruit Instructor, reports that during the past season the prevalence of black spot on vines of practically all varieties was most marked, and this disease in conjunction with downy mildew took a very heavy toll of the grape crops on the Murrumbidgee Irrigation Areas.

Few growers realise the importance of stripping the vines of all loose bark and of scraping the main stems; this, if done thoroughly, will leave the main wood fairly clean for three years at least. The work of scraping certainly takes some time, but it can be commenced before the main pruning is started and when the work on the farm is somewhat slacker than usual. A bent piece of iron with a few teeth filed in one end makes a very handy and effectual scraper, and takes off the loose bark rapidly and easily, and the sprays have then a far better chance of penetrating into any cracks or callosities on the main arms and stem than if the work is not done; moreover, in the case of vines (sultanas and currants especially) that are to be cinctured, scraping will facilitate the work.

All cuttings and loose bark should be burnt as soon as possible to help eliminate the source of infection in the coming season.

When dormant the vines should be swabbed with a solution composed of the following materials.—

5 lb. sulphate of iron (greenstone).
½ pint sulphuric acid.
1 gallon water.

Dissolve the sulphate of iron by suspending it overnight in a piece of bagging in the water. In the morning add the acid slowly to prevent any spurting. Use a wooden or an earthenware vessel.

A solution of 10 gallons of water and 1 gallon sulphuric acid has also been used very effectively as a winter treatment, either as a swab or a spray, but if as the latter, then the spray pump must have leaden washers, as the acid will corrode and eat away any other metal.

If only one swabbing is to be given, it should be done as close as possible to the time of the bursting of the buds, but care must be used not to swab too near to the full burst stage, but rather just as the buds are swelling. The swabbing will be found to delay the bud burst for over a week, and in places where frosts are likely to appear or in frost pockets, this is sometimes an advantage.

Though swabbing reduces the amount of infective material upon the vines, and thus delays the outbreak of the disease, it is often necessary to follow this up with Bordeaux mixture sprays after the vines start growth in the spring and during the summer. A leaflet on the control of black spot of the grape vine is obtainable from the Department.

The Bordeaux mixture spray used to control black spot and downy mildew does not always keep oidium in check, and it is sometimes necessary to dust the vines with sulphur. A leaflet on oidium is also obtainable. Dusting with sulphur at the time of blossoming will be found to have a marked effect on the setting of the berries, and should be carried out every year on vines that are erratic in setting their fruit. With a dust gun a man can cover many acres a day and the quantity of sulphur will be found to amount to only about 40 to 50 lb. per acre to give an effective sulphuring.

Codling Moth.

Growers who still continue to bandage their pome fruit trees are advised to remove the bandages during this month (July) and leave them off until the loose bark is scraped from the trunks of the trees and any interstices or small holes are filled in with putty to prevent grubs harbouring in the trees. This should be completed by November, when the bandages should be replaced on the trees.

With constant attention and compliance with the spraying regulations some growers in the Irrigation Areas are finding that they can keep the codling moth in check. Breakwind trees of pome fruits, rows along head-ditches and odd trees in small town gardens are the greatest menace to good growers if they are neglected.

Remove Flower Bud from Banana Bunch.

There has always been much difference of opinion among banana-growers as to whether or not the flower bud (which continues to hang at the end of the bunch after the fruit is set) should be removed, and even those who agree as to its removal are often at variance as to just when is the correct time to carry out the job.

The following extract from the twenty-eighth annual report of the Bureau of Agriculture, Philippine Islands, is to the point:—"The removal of the flower heart after the development of the bunch delayed the maturing of the fruit from five to thirteen days, but they grew much bigger in size than those on the trees where the flower remained uncut."

In forwarding this extract, Mr. H. W. Eastwood, Fruit Instructor, Byron Bay, points out further that bunchy top disease is sometimes only discernible in a plant in the male flower bracts which shelter the immature and tender male fruits. Moreover, after a bunch is produced the flower heart is an attractive part of the plant for the banana aphis, and if for no other reason than this, should be severed from the bunch.

When the flower bud will readily snap off if it is lifted to a perpendicular position appears to be the natural time to remove it from the bunch.

The Banana Growing Industry in Fiji.

According to the latest annual reports of the Fiji Department of Agriculture there was a further falling off in exports of bananas during the year 1929-30. Fiji bananas, states the report, are highly regarded in New Zealand, where there is a demand greatly in excess of Fiji's present capacity to supply.

In the last five years exports of bananas from Fiji have decreased from 283,237 cases in 1925 to 187,838 in 1929. All but 300 cases were consigned to New Zealand in 1929, being about 90,000 cases short of that Dominion's requirements. Consequent on the shortage of supplies exceptionally good prices were received, the average for the year being 19s. 3d. per case.

Pests and diseases are responsible, to a large extent, for the decline of the industry in Fiji.

Experiments with the Banana Borer in Fiji.

As all sources of supply of banana suckers in Fiji are borer infected, the problem of finding some method of destroying the pest in suckers is a very live one in that country. Three methods have been tried out, and although two of these have proved successful they are not considered practicable commercially, and consequently further investigations of the problem are contemplated.

Totally immersing the suckers in water for fourteen days killed the suckers without destroying all the borers. The second method tried—fumigation with carbon-disulphide in a vacuum—gave a kill of 90 per cent. borers without injuring the suckers. One hundred per cent. kill without any apparent injury to the plants was obtained when the plants were partially immersed in water for a period of twenty-one days.

Inland and Coastal Raised Strawberry Plants.

The observations of Mr. Fruit Inspector W. R. Griffin regarding the merits of inland-grown and coastal-grown strawberry plants are interesting.

On being transferred from the Murrumbidgee Irrigation Area to Castle Hill, Mr. Griffin was struck by the difference in growth of Creswell strawberry plants at the two places—those growing on the Area being, to all appearances, much more robust. To satisfy himself on the point he arranged for Mr. England, of North Ryde, to carry out a trial with both types of plant. Accordingly, 500 plants from each centre were planted side by side under conditions similar in every respect, and, although the Griffith-raised plants maintained their superior vigour, produced a heavier first crop, and set runners earlier than the local plants, the latter produced a heavier second crop. Even so, Mr. England considered that the advantage was still with the introduced plants, owing to the much heavier first crop.

The trial was carried still further by planting runners from both plots. The local plants proved distinctly superior, although in that same season a fresh lot of Griffith-raised plants introduced and planted at the same time as, and under similar conditions to, another plot of locally-raised plants produced a heavier first crop.

From the foregoing it would appear that, although conditions at Griffith favour the production of a more robust type of plant, the superiority is maintained for only one seaosn when the plants are transferred to the coastal district.

Origin of Cleopatra Apple.

It has now been established that Cleopatra is identical with the American variety Ortley, which originated in the orchard of Michael Ortley in southern New Jersey, U.S.A., and which variety was first described in America by Coxe in 1817 under the name of Woolman's Long Pippin. This variety is credited with having some thirty synonyms in America.

PLEURO-PNEUMONIA NOT TRANSMITTED TO HUMAN BEINGS.

MR. MAX HENRY, Chief Veterinary Surgeon of the Department, advises that there is no reason for anxiety regarding the milk supply in a district in which pleuro-pneumonia has been reported. This disease of bovines is not transmitted to humans, and, moreover, one of the marked symptoms of an acute attack of pleuro-pneumonia is that the milk supply of the affected cow goes off. In chronic cases, of course, the cow goes on milking, but as she does not develop a high temperature and is not affected in a general way, the milk is in no way affected.

WHAT IS THE AVERAGE LIFE OF THE WORKER BEE ?

THE answer to the question is of great importance to the apiarist, for when the conditions that govern the period of existence are understood something might be done towards making it (at a desired time) considerably longer. The length of life of the worker bees is governed by the energy they put into their work. For instance, during a honey flow, when the condition of the colony is normal, with young bees hatching freely, the bees put so much energy into their work that they become quite aged and usually succumb in six or seven weeks. Again, if any abnormal condition (such as the loss of the queen) takes place, then to some extent the bees will conserve their energy so that their lengthened life will give the colony a chance to recover. The period at which this conservation of energy is most desirable is during the winter, and it is at this season that the apiarist himself may help. If wintered in a good hive with ample stores under favourable conditions, the young bees of a populous colony will come into spring with comparatively undiminished energy, so great is their power at this period of conserving their vitality.

The interesting life history of the honey bee and the means by which its energy can be put to profitable use are discussed in detail in Farmers' Bulletin No. 129, *The Beginner in Bee Culture,* obtainable from the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney. Price, 1s. 2d. posted.

Poultry Notes.

JULY.

E. HADLINGTON, Poultry Expert.

IN view of the fact that numerous requests have been received for information in connection with incubators and incubation, these matters have been chosen as the subject for this month's notes.

Matters relating to the care of breeding stock, which have an important influence on hatching results, were dealt with in the notes for June. The first consideration in regard to incubation is the class of eggs most suitable for the purpose. The necessity for careful selection of eggs for incubation is well recognised by all experienced breeders and is a vital factor for the production of rearable chicks and strong stock. Small eggs are laid by immature or degenerate layers, and the use of such birds as breeders must be strictly avoided. All eggs used for incubation should be at least 2 oz. in weight, and, even early in the season, when there may be a shortage of eggs, it is better to leave the incubators only partly filled rather than use unsuitable eggs. Eggs for incubation should be as normal and even as possible in size, shape, and texture of shell, and any with thin, misshapen, and porous shells should be eliminated; also eggs that are abnormally large; for instance, those weighing over 2½ oz. should not be included, as in most cases they are infertile.

The aim should be to build up flocks capable of maintaining sufficient stamina to withstand the strain of high production, and proper selection of eggs for incubation is one important step in that direction. The freshness of eggs is also a factor which will affect hatching results, and the longer the eggs are kept over one week the less are the chances of a good hatch, especially in the case of artificial incubation. If set under a hen, eggs will often hatch well even if two or three weeks old, but when stored for a longer period than a week it is a good plan to place them in a box with the large end slightly inclined upwards, and cover them with bran. They should also be turned each day, and this can be done by turning the box over.

The temperature in the room in which the eggs are stored should be kept as even as possible. Breeders in a small way, who have only one or two incubators, may find it necessary to keep eggs a little longer than the prescribed period rather than discard them, and the exercise of a little care in storing stud eggs awaiting the time when they can be placed in the incubator will materially assist in preventing deterioration. It is well to remember, however, that two weeks is the limit that eggs for artificial hatching can be kept, even under proper conditions, with any hope of obtaining reasonably satisfactory results.

Operating an Incubator.

An incubator room which will keep up a fairly even temperature is desirable, and this is more particularly emphasised with regard to machines of very small capacity, the reason being that the small machines contain a smaller volume of heated air, and in consequence are more subject to fluctuations due to changes in outside temperatures.

In setting up an incubator the machine must be placed quite level, and a spirit-level will be required to ensure exactness. If this is not done there will be an uneven temperature over various parts of the egg tray.

Regulating the Temperature.—The automatic regulation of an incubator is controlled in some machines by a thermostat, and in others by a capsule The thermostat consists of bars of two different metals, one of which is more sensitive to temperatures than the other. These parts are not likely to get out of order unless strained or broken. They can be tested by holding them in hot water and noting the amount of expansion; if it is very marked, it can be taken that the instruments are in good order. Even a casual inspection, however, will reveal whether they are damaged or not. In the case of a capsule the same test is satisfactory, or it can be removed from its bracket and a lighted match held underneath at a distance of about 2 inches. If the spirit or ether has leaked out it will remain flat, and a new one will be required

The automatic regulation of an incubator should not be depended upon entirely, as adjustments to the regulating screw, as well as to the lamp, are sometimes necessary when the eggs are more advanced in incubation, or where it is necessary to counteract wide variations in outside temperatures.

Testing the Thermometers.—It is advisable before commencing the hatching season to test the thermometers of all incubators because they sometimes get out of order. An easy method of testing them is to immerse them in a dish of warm water at a temperature of about 100 deg. Fahr. and allow them to remain in the water for a couple of minutes. A tested thermometer, if available, should be placed in with the others, but, failing this, if the majority of the thermometers register the same it can be taken that they are correct, and those which differ are wrong.

The Lamp.—At the beginning of each season all lamp burners should be thoroughly cleaned, and an effective method of doing this is to take out the wicks and boil the burners in soap and water to which has been added a little washing soda. New wicks should then be obtained.

A practice should be made of cleaning the wicks and burners every day, preferably late in the afternoon, so as to ensure a satisfactory light during the night. It is a simple matter to clean the wick and burner by turning the wick down and brushing over the burner sleeve with a small brush, such as a tooth-brush. If any corrosion is forming, remove it by scraping with a blunt knife. The crust which forms on the wick can be removed with the fingers after turning it up about half an inch. The wick should then be turned down to the level of the sleeve and pressed with the fingers to level it up, after which the corners should be rounded by also pressing with the finger. After lighting the wick, if it does not burn evenly it should be dabbed with the fingers to make a somewhat rounded flame.

All burners have a small vent alongside the wick sleeve and it is important that this should be kept clear to allow of proper combustion, and that the burners should not be dented or misshaped in either the cap or the wick sleeve, as this will affect the evenness of the light. Great care should be taken to see that the flame is quite even as any long points may strike against the flue and cause an accumulation of carbon. This is the principal cause of incubators catching fire.

Sanitation.—A practice should be made of fumigating the incubators each season before using them. Probably the best method to adopt is the use of formaldehyde gas, which is made by pouring formalin over permanganate of potash. The quantities required are ½ oz. permanganate of potash to 2 oz. formalin for approximately every 10 cubic feet of the incubator chamber. The action of formalin on potassium permanganate will cause a strong effervescence, therefore the vessel containing these chemicals should be sufficiently large to prevent overflowing. The permanganate should be placed in a dish in the machine, and the formalin quickly poured over it, after which the incubator should be closed up for at least a few hours. Care should be taken not to inhale the fumes. The trays and framework underneath can be cleaned with a disinfectant solution.

Working Instructions.

Heating up.—When starting the incubator the temperature should be raised to 103 deg. Fahr. and maintained at that level for about twelve hours before putting in the eggs, after which it is as well to allow another twelve hours for them to become heated through before attempting to regulate the temperature.

Temperature.—A temperature of 102 deg. Fahr. should be maintained during the first week, after which it may be increased to 103 deg. and continued at this level until the eggs begin to chip, which may occur as early as the nineteenth day. The temperature can then be increased to 104 deg., or even 105 deg., until the hatch is finished. The bulb of the thermometer should stand just clear of the eggs.

Turning.—It is not necessary to turn the eggs during the first thirty-six hours, after which they should be turned twice daily up to the ninth day at least, but afterwards only once a day is necessary. There is no harm, however, in turning them twice a day until the time of chipping, when turning should cease.

The importance of turning eggs is not always recognised. The idea is to keep the embryo in different positions to prevent it adhering to the shell. This is one cause of dead germs and deformities in chickens. Moreover, the heat in lamp incubators is applied from the top, and turning ensures equal distribution on all parts of the egg. When the egg becomes advanced in incubation frequent turnings are not so necessary as in the early stages.

Cooling.—Cooling of the eggs should commence after the sixth day, and this can be done by leaving the trays out of the incubator for a few minutes at first, gradually increasing the time of cooling as the hatch progresses, so that towards the end of the hatch they are allowed to cool for fifteen to twenty, or even thirty, minutes, according to the temperature of the room. It is not advisable, however, to cool them for thirty minutes as a regular practice and cooling should cease when the first egg is chipped.

Testing.—After about the sixth day of incubation the eggs can quite easily be tested to eliminate the infertile. There are many ways of testing the eggs, a simple method being to cut a hole in the wall of the incubator room on the sunny side and place over it a sheet of plain glass; the eggs can then be held up to the hole for inspection. It is necessary, of course, to darken the room so that the contents of the egg are clearly visible. Where electric light is available a hole cut in a table with an electric bulb placed underneath can be used in the same way. Small egg testers are also available from sellers of poultry equipment.

Ventilation.—In incubators which have controllable ventilators, the ventilators should be opened gradually after the sixth day, increasing the amount of ventilation as the hatch progresses, but closing up the ventilators again at the first sign of chipping. After chipping commences the door of the incubator should be kept closed until the hatch is over. If frequently opened, drying out will result and a bad hatch ensue. In cases of an exceptionally good hatch causing too much crowding, it may be necessary to open the door quickly and remove most of the chicks.

Moisture.—With a good incubator room and a well insulated machine there should be no need to apply moisture unless much ventilation is allowed. In other words, there is sufficient moisture in the egg if it is conserved. In some types of machines provision is made for supplying moisture, either by using damp sand or water placed in trays in the incubator. In such cases it is as well to follow the manufacturer's directions with regard to the supply of moisture.

Dead in the Shell.

It is inevitable that a percentage of fully formed chicks will be found dead in the shell, and although there are many known causes to account for a high percentage of such deaths during incubation, there is room for research work in connection with this problem. Much of this trouble is accentuated by faulty management or poor class breeding stock, or any adverse treatment the eggs may be subjected to in the incubator. The novice is often concerned that the shell of the eggs is too hard or thick, but the fact is that even a weak embryo may form into a chick, but it is only the strong chickens that can emerge from an egg.

The idea that lack of moisture is the sole cause of "dead in the shell" is common because of the noticeable drying of the shell membrane after the egg is pierced. This drying occurs no matter what is the cause, and no amount of moisture would make any difference. Insufficient moisture must, therefore, be regarded as only one possible cause of the trouble. Such factors as fluctuations of temperature during the hatch or a very high or low range are often responsible for a high rate of deaths in the shell.

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1*st August*, 1931.

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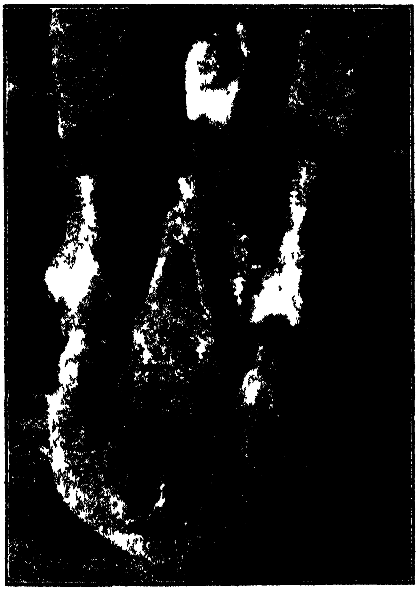
VOL. XLII. PART 8. AUGUST 1, 1931.

Agricultural Gazette of New South Wales.

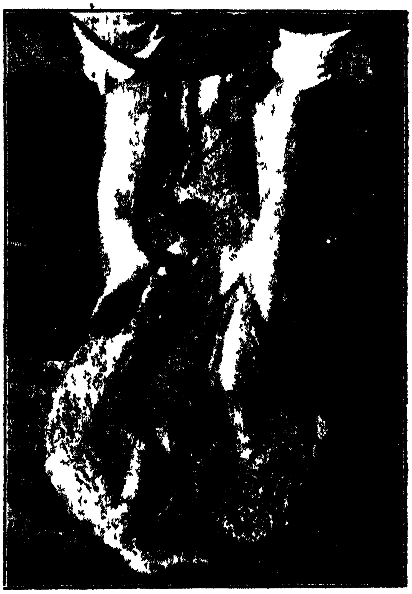
Conditions which Predispose Sheep to Blowfly Attack.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research

IN a Science Bulletin* just issued by the Department, the writer, with Messrs. H. G. Belschner and C. R. Mulhearn, has recorded the results of certain observations made on this problem at the Nyngan Experiment Farm during the past four years, and the purpose of this article is to express these results in somewhat simpler form and to add other observations which have been made regarding sheep blowfly attack.



Class A Sheep—Plain Breech.
Not struck during summer 1930–31.



Class C Sheep—Wrinkled Breech.
Struck five times during summer 1930–31.

At the outset we sought to find out why sheep became struck, and particularly whether fly attack was always due to conditions apart from the sheep or whether the state of the sheep played an important part. As merino ewes are the class of sheep most frequently struck, our basal work at Nyngan has been conducted on a flock of commercial sheep of merino breed numbering about 1,500 and maintained there for this specific purpose. In addition, however, observations have been made from time to time in other parts of the State, and in this we have been aided by information and material brought to our notice by other officers of the Stock Branch. These observations, apart from Nyngan, have not been so numerous or extensive as could have been desired, and it is felt that had it been possible to extend them our knowledge of the condition might be much more comprehensive.

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* "Observations on Cutaneous Myiasis of Sheep (Sheep Blowfly Attack)," by H. R. Seddon, H. G. Belschner, and C. R. Mulhearn (Science Bulletin No. 37, 1931, N.S.W. Department of Agriculture).

Normal and Abnormal Form of Fly Attack.

Every year on properties carrying merino ewes a percentage of such sheep is struck, and this quite apart from any really exceptional weather conditions. This percentage varies considerably with the kind of season, prevalence of flies, amount of green feed, &c. During these seasons, therefore, fly attack occurs in what one might term its *normal* form. In certain years, or following certain occurrences to be mentioned below, there occur additional attacks by fly, but as these are clearly due to a special type of conditions they may be classed as the *abnormal* form. During the occurrence of these attacks of abnormal form it is not unusual for the percentage of sheep affected by the normal form to be increased considerably by reason of the fact that the attractiveness of the flock as a whole is considerably increased, that the pertinacity of the fly is augmented, and that, usually, flies are more prevalent, the environmental conditions having then favoured their propagation.

We may therefore classify fly attack as follows:—

(1) *Normal form.*

Striking of ewes around crutch and tail
Striking of wethers around prepuce Strike of the head of rams.

(2) *Abnormal form.*

(*a*) Strike following "water rot" of wool, most commonly about the withers or back, and seen equally in ewes and wethers.

(*b*) Strike around vulva and crutch in ewes affected with inflammation of the womb (metritis) following difficult parturition.

(*c*) Strikes occurring in lambs following tailing (both sexes) and in wethers following marking.

(*d*) Strike associated with any discharging wound, whether intentionally inflicted or not, *i.e.*, operation wounds, shear cuts, ulcerated "cancers" of the ear, grass-seed infestations below the eye (infra-orbital sinus), of lesions of "scabby mouth" on the muzzle of lambs or of gangrene of the udder of ewes; wounds sustained by rams whilst fighting.

Normal Form of Fly Attack.

It will be seen from the above that there is a difference between what have been classed as normal and abnormal, inasmuch as in those groups classed as the abnormal form there is some definite local attraction presented to the fly, which otherwise in all probability would not strike such an animal—at least in the area involved in the abnormal form. In what we have alluded to as the normal form, however, we consider the case of sheep in which there is no wound, no abnormal discharge, no special odour, and which would appear to most as offering no special attraction to the fly.

Certainly these sheep may be affected with diarrhœa, but not all animals so affected are struck, and one knows that sheep not showing diarrhœa are not infrequently struck. The sheep referred to as being subject to the normal form of fly attack are the ordinary type of merino ewes running on any holding, and owners know that at any time of the year, except perhaps July and August, a percentage is liable to be struck.

When questioned upon the subject sheep-owners have not been unanimous as to why such sheep should be struck. Some have maintained that it is only sheep which are "unhealthy" that are struck. With this we cannot agree, though, of course, we recognise that any obviously sick sheep is much more likely to be struck. The fact that certain sheep are struck, and perhaps struck repeatedly, is held by some to be due to such animals giving off an odour attractive to the fly. It has been noted by many that certain sheep are especially prone to fly attack, and we have therefore inquired as to the possibility of fly attack being due to some factor inherent in the sheep, It has always been recognised that Vermont sheep are particularly prone to fly attack, and a very significant fact is that fly attack first became serious in Australia when Vermont sheep were introduced. Stock-owners recognised this, and speedily discarded the Vermont, setting about the elimination of that strain from the sheep.

Most owners could pick out individual sheep which were especially prone to fly attack, but the fact that susceptibility might be a factor possessed by all sheep in greater or lesser degree, ever present in the sheep, was not recognised, and those owners who considered that sheep which became fly-struck possessed previous attraction have held no definite opinion as to what it actually was that attracted the fly, or at least have not been able to recognise it in the sheep. Further, many owners have believed that flies struck sheep by chance.

Our investigations were, therefore, aimed to find out—

(*a*) If sheep were struck by chance or whether there was some definite factor affecting susceptibility.

(*b*) If this susceptibility factor was inherited

(*c*) The nature of this factor.

Before stating the results of these observations it might be pointed out that the flock with which we dealt may be described as carrying wool strong to medium in type, of an average 64s, not heavily conditioned, and with a variable amount of dust and burr, according to season. The conformation of the sheep may be described as plain-bodied in the case of the farm-bred sheep, but certain purchased sheep were smaller-bodied, somewhat finer woolled, and showed a certain amount of wrinkles, though the latter were not marked. As every sheep was ear-tagged with a number, and that number noted when the sheep became struck, we have records of the fly attack for each sheep each season.

As a result of these observations we have found that the same sheep are struck each season, and therefore fly attack is not a matter of chance;

further, that sheep struck repeatedly one season are commonly re-struck repeatedly during following seasons.

At the end of the first season the sheep were divided according to the number of times they had been struck, and the individual sheep in these groups carefully examined as to several factors. These included (*a*) type of wool, (*b*) conformation of breech, as regards wrinkles or folds, (*c*) distance between aitch-bones, (*d*) malformation or injury to vulva, etc.

As the wool generally was of an even type, it was not to be expected that any great difference would be observed, but we certainly did not find that the group which had not been struck was relatively strong-woolled and the group of sheep struck most frequently (over six times during the season) relatively fine-woolled. The wool on the whole was not heavy-conditioned, but for comparative purposes was classed in three grades, viz., light, medium and heavy. The comparison of the "most struck" group with that "not struck" showed that, taken as a whole, the former showed more condition than the latter. The difference, however, was not very marked.

Whilst there is evidence that in cases where the vulva is so distorted (owing to malformation or injury) that the sheep habitually urinates against the side of the crutch, and so predisposes to fly attack, it does not necessarily mean that all sheep with distorted vulva, or all sheep with no tip to the vulva, so soil themselves. As to other factors apart from degree of wrinkling, there was no marked or regular difference between the sheep frequently struck and those not struck at all.

We carefully classified the whole of the sheep as to the presence or absence of wrinkles or folds above and on the tail, in the crutch and to the sides of the breech, and when this was done it became very evident that there was a gradation of wrinkling from Group 1 (not struck) to Group 5 (struck over six times). The breech of sheep in Group 1 was practically free from any wrinkling whatever, whilst Group 5 was very wrinkled, the various intermediate groups showing increased wrinkles from Group 2 to Group 4. The degree of wrinkling of the tail, sides of breech and crutch, though commonly the same for each situation, is not necessarily always so. It thus appeared very definite that susceptibility to fly attack was determined by conformation of the breech, which in the majority of cases concerned the degree of wrinkling, and was therefore a factor inherent in the animal. In some few cases the susceptibility could be ascribed to malformation of the vulva, and in some of these was post-natal and the result of injury at some time, resulting in distortion of that organ.

These observations were made in August, 1928, and in order to test the soundness of our opinions an attempt was made to classify a small line of sheep which had not been struck, and see if we could really recognise the most susceptible sheep. A flock of 185 ewe weaners, all farm-bred, were numbered and branded as follows:—

Group A (red)	Insusceptible.
" B (green)	Partially susceptible.
" C (yellow)	Definitely predisposed to fly attack.

They were run together, and as each sheep was struck the number of the animal and the colour of the brand were noted. At the end of the season it was found that the strikes per hundred sheep in each group was as follows:—

Group A	5·4
" B	26·1
" C	95·0

These results indicated that it might be possible to group weaners according to susceptibility, and that 70 per cent. of the strikes might occur in that third of the sheep previously picked out as the most susceptible.

Encouraged by these results, the whole of the adult ewes (1,202) on the farm were similarly classified, when it was found that during the ensuing season the strikes per hundred sheep in each group were as follows:—

Group A	47
" B	104
" C	173

Similar observations have been continued during the past two seasons, each season's ewe weaners being classified, and the strike in them and in the older ewes has been distributed similarly to previous years.

If we express these results another way, we find that in different flocks the relative susceptibility of Group A to Group C has varied from 1: 2.4 to 1: 17.4, and that the susceptibility of the intermediate group is less than half the susceptibility of Group C. It has also been found that whilst the ratio narrows during a year of severe fly attack, yet there is still a very definite ratio between the groups.

Sheep have also been classified on certain private properties, and the above has been found to hold good. The most recently available figures concern 310 special stud ewes classified by my colleagues in October, 1930, the subsequent strike being as follows:—

	Sheep.	Strikes.
Group A	105	44
" B	103	130
" C	102	247

The relative frequency of strikes in each group is therefore 1, 3, and 5.6. In this flock there were 421 strikes to dress. Had these sheep been all Class C the strikes might have numbered 750, whereas had they been Class A they might have been reduced to 130. As there were only 310 sheep in the flock classified, it is plain that a considerable difference would have been made if the number had been several thousand.

Here, of course, another point opens up, namely, whether if susceptible sheep were removed from a flock the fly would strike the less susceptible ones. If that were so, one would expect to find that in districts in which the fly is prevalent all sheep, regardless of conformation or breed, would be attacked; but such does not occur. Certain conditions appear to be necessary for the development of maggots on sheep, and it is the presence or absence of these which seems to determine whether fly-strike will take place. The presence or absence of these conditions appears to be a factor of the individual sheep, and is not influenced by the fact that other sheep are or are not running with it. Therefore, if a certain class of sheep is comparatively unattractive (because of the absence of the factors which we consider lead to attraction) we are unable to see how they would become more attractive by the elimination of another portion of the flock. It may be that they would be, but, until it is proved to the contrary by definite observation, the indications are that this offers a method of selection whereby the incidence of the fly might be lessened, if not entirely eliminated, and one which certainly ought to be given a trial.

This susceptibility factor being a factor present in the sheep, we have naturally endeavoured to find out whether it is inherited. We therefore bred Class A ewes with Class A rams, Class B ewes with Class B rams, and Class C ewes with Class B and C rams. The resulting lambs were classified, and the following figures may be quoted:—

		Per cent.	
A ewes and A rams	Lambs	52	A
		42	B
		6	C
C ewes and B or C rams	Lambs	10	A
		51	B
		39	C

(In the case of B ewes and B rams the figures were 24, 54 and 22 per cent. respectively.)

To test the validity of the above we may compare the relative strike in these lambs, when we find that lambs classed as A showed 93 strikes per hundred sheep, but lambs classed as C showed 304 strikes per hundred sheep, *i.e.*, over three times as many.

Again, if the susceptibility factor be inherited, then it would follow that the A ewes (which are less susceptible than C's) should produce lambs which are less susceptible than the progeny of C ewes, and that this is so is seen from the following figures:—

Lambs from A ewes	135 strikes per 100 sheep.
Lambs from C ewes	239 strikes per 100 sheep.

Lest there be any doubt upon the subject, it may be mentioned that in all the cases we have quoted the sheep of A, B and C classes were always running together.

One may now summarise our knowledge of what we have termed normal form of fly attack as follows:—

1. The individual sheep in any ordinary flock of ewes vary in susceptibility.

2. Fly-strike is, in the main, manifested by the same sheep each season. Thus, sheep the most frequently struck one season will form the group most frequently struck another season, and conversely, those struck little or not at all one season will be those least affected by fly in succeeding seasons.

3. Comparing groups of sheep "frequently struck" with those "not struck," we find the only marked difference is in conformation of the breech, those "frequently struck" showing more wrinkling than the other group.

4. If one divides a flock of sheep into groups according to the frequency of fly attack, one finds that the degree of wrinkling varies in accordance with frequency of fly strike.

5. If one examines struck sheep one finds in the great majority of cases that the strike has originated (*a*) in a wrinkle (infold of skin) where the wool has become "sweaty" or moist from urine; (*b*) on top of a wrinkle (outfold of skin) which has similarly been constantly urine-stained or otherwise kept moist, as by diarrhœa. In a few cases the breech may be quite plain, but the sheep habitually urinates to one side of the crutch: such is much more likely to occur with sheep having a prominent outfold (wrinkle) each side of the breech. Urine-staining, sweatiness and diarrhœa, as supplying the moisture factor, are of importance in that order. The essential thing is an area of perpetual moisture, such as is furnished by continual soiling by urine or by folding of skin in such a way that such moisture (whether from urine or sweating) does not get an opportunity to dry out. In such situations there is considerable decomposition of urine and/or skin exudations, probably largely bacterial in nature, and in all likelihood it is because of these decomposition processes that the area is rendered attractive to the fly. Crutching, as a preventive, owes its usefulness to the fact that it allows drying-out of the part and so stops this bacterial activity.

6. Sheep may be graded or classified according to anticipated susceptibility, and the strikes following have been found to occur in accordance with anticipated susceptibility.

7. The progeny of ewes themselves frequently struck are struck more frequently than the progeny of ewes which have been struck only infrequently or not at all.

8. Mating Class A ewes with Class A rams gives a high percentage of A lambs and a low percentage of C lambs. Conversely, mating C class ewes with B or C rams gives a low percentage of A lambs and a relatively high percentage of C lambs.

9. The observations regarding susceptibility have been confined to ewes. We have not yet formed an opinion as to any variation in susceptibility of rams as regards frequency of strike about the head. It is thought, however, that similar factors may operate. In the case of wethers strikes around the prepuce are no doubt associated with the factor of urine-staining.

10. The conformation of the crutch of rams varies in similar fashion to that of ewes, and we consider that rams with a markedly wrinkled breech are more prone to get lambs of similar conformation than would rams with plain breeches.

11. As to wool—whilst that of sheep of Class C is usually more heavily-conditioned, such need not be very marked, and, in the one flock, sheep classed as A were not relatively strong-woolled nor Group C relatively fine-woolled.

12. These several points suggest that by a process of selection and culling the susceptibility factor might very largely be bred out. One might feel that if this were done the quality of the wool might suffer, but our observations go to show that such need not be the case, and in certain figures we have been able to obtain it has been found that, taken as a group, Group A would give a better return than Group C.

Abnormal Form of Blowfly Attack.

The foregoing deals with what we have termed normal fly attack, and owners may, with justification, say that this does not represent the whole story, and that sheep may be struck anywhere about the body. They may, and it is the purpose of the second part of this article to deal with the abnormal form or special manifestations of fly attack. That the abnormal form may be more serious, in that a larger percentage of sheep may be attacked, is also probably true, but it must be remembered that the types of the abnormal form do not occur as frequently. That the normal form may itself, apart from the fact that it is the commoner, be quite serious is indicated by the following figures:—

Nyngan ewes, 1927–28	111 sheep with 337 strikes.
,, ewe hoggets, 1930–31	225 sheep with 673 strikes.
Private flock—ewes, 1930–31	310 sheep with 421 strikes.

The types of the abnormal form were listed in an earlier part of this article, but may be given again and grouped according to the particular predisposing factor associated with each, thus:—

Predisposing factor.	Type of abnormal form.
Heavy warm rain followed by warm (humid) conditions so that sheep do not dry.	Fly strike following "water rot" of wool. (Also increase of normal form.)
Sheep grazing in long wet grass; weather mild.	Fly strike about neck-folds.
Inflammation of womb with discharge from vulva.	Fly strike around vulva and crutch from soiling by discharges.
Lamb marking	Fly strike of tail or scrotal wounds.
Shearing	Fly strike of wounds.
Various disease conditions—	
(*a*) Grass-seed wounds below eye ...	Fly strike of lesions of disease. (Chiefly under partly loosened scabs.)
(*b*) Ulcerated growths on ear	
(*c*) Scabby mouth in lambs	
(*d*) Gangrenous mammitis in ewes ...	
(*e*) Mycotic dermatitis or other skin disease.	
Fighting of rams	Fly strikes of wounds of poll.

Whilst fly attack may occur following any of the predisposing factors mentioned, the most important is that following the effects of warm (particularly autumn) rains, followed by humid conditions so that sheep do not dry. This aspect of the problem has been investigated only in part, but observations would go to show that two distinct types of fly attack may be manifested, and yet these two types are related and have a common basis. Under such circumstances sheep become struck (*a*) about the crutch and (*b*) over the withers or back. The striking about the crutch is simply the normal form of fly attack, though unusually intensified, for the wet or humid conditions give the sweaty and decomposition products of wool in the wrinkles or folds less chance to dry out. The factors which govern normal fly attack still hold good, namely, that ewes are much more commonly attacked (for it is only in females that the crutch is likely to be urine-soiled), and that the more wrinkled sheep are struck more frequently than those less wrinkled, whilst those with plain breeches escape, unless the wool of the region is long and urine-soiled.

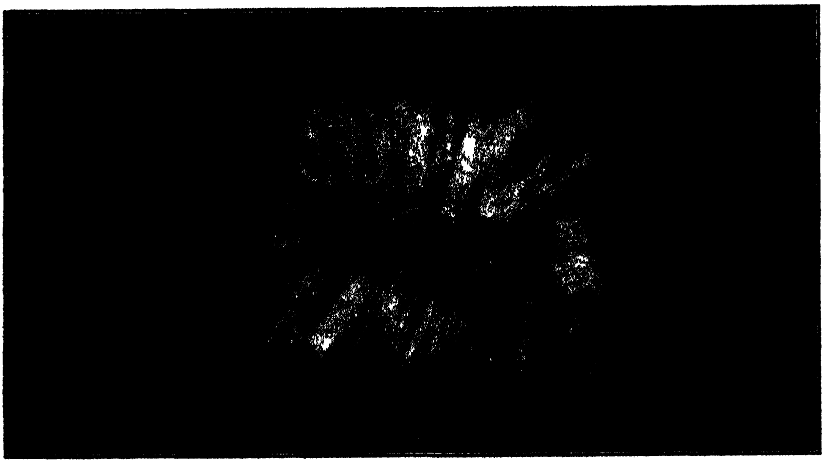
The striking about the withers and back is possible only because the continued wet conditions allow the multiplication of bacteria in these regions. Any one examining such sheep prior to their being struck will note that the wool is stained and matted together with a glutinous material. This matting is commonly down on the skin, but if wet conditions have been prolonged will affect all wool grown during that period. It is not unusual in a wet autumn, therefore, for the wool next the skin to be matted in a band one-quarter to half an inch deep. The discolouration may vary; perhaps the commonest colour being some shade of yellow or light-brown, with a distinct green colour not uncommonly present. At other times one notes that the wool is red, orange, or even violet or black in colour. These various colours are produced by bacteria. The green colour is due to one type of bacterium, the orange or yellow to others, and the red to the green-pigment-producing bacterium growing in association with an acid-producing organism. Not infrequently the bacteria do not produce any definite colour, and the matted wool is simply a greyish yellow.

Sheep Showing Effects of So-called "Water-rot,"--Really a Bacterial Affection.

Note that the sheep has been struck over the top of the shoulder. The wool of other parts of this sheep was discoloured

Prior to investigations carried out at Glenfield it was assumed that these stainings were simply due to the effect of rain itself, *i.e.*, of water, aided perhaps by something gathered from the soil or vegetation. Thus, the fact of sheep standing under dripping stringy-bark trees has been thought to be of significance. Whilst water (rain) is essential, it cannot of itself cause the condition, and the actual cause is bacterial, though these bacteria cannot multiply and produce their effects if the wool remains dry.

The wool of the sheep is normally dense and turns most of the rains that fall, and such as does penetrate the wool usually dries out fairly rapidly. When, however, such moisture is not able to dry out, the surface scales shed from the skin, and to some extent the wool scales and yolk become swollen into a pasty mass and provide an eminently suitable breeding-ground for bacteria The bacteria responsible for the condition occur in soil, and probably more commonly in the dust of sheep yards, and thus, prior to the rains, the sheep are probably already infected to some extent. When the bacteria in this so-called "water rot" condition are actively growing the complaint may be readily spread from sheep to sheep if they are huddled together. This may occur to some extent when they are trying to take shelter, but occurs even more commonly when such sheep are yarded or put together to treat those already attacked by fly. Lest anyone may doubt the fact that the condition is really infectious, it may be mentioned that at Glenfield we have transmitted the green wool discolouration to other sheep merely by putting them with an affected sheep in a small open pen during wet weather. Further, that if a lock of wool affected with any of these "water rot" conditions be tied in the wool of a healthy sheep, and kept moist, the surrounding wool will soon become affected. Also, that the green and yellow discolourations have been produced by putting some of the bacterial cultures themselves on the wool of normal sheep and keeping these areas moist.



Open Fleece Showing So-called "Water-rot" in Actively Growing Stage.

This sheep had an attack about two months ago as shown by definite line about half an inch from the skin More recently wet weather has caused the condition to recur, and it has spread down the fibres and affected all the wool from original staining right down to skin

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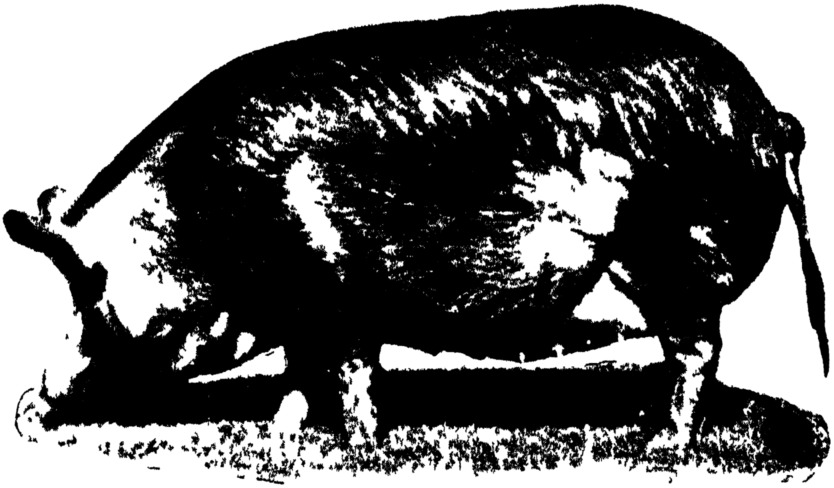

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G. D. ROSS, Under Secretary, Box 36A, G.P.O., SYDNEY.

What is really going on in these cases is a bacterial decomposition of surface skin scales, wool scales and yolk, and, as is common in bacterial decompositions, arc area gives off an odour which is obnoxious to us but attractive to the blowfly. The writer recently had the opportunity, in company with Mr. A. L. Rose, District Veterinary Officer, of investigating the fly attack associated with the so-called "water rot," and as evidence of the seriousness of this form it may be mentioned that in the case of one flock of 3,300 sheep seen 60 per cent. had been attacked by fly. This had necessitated shearing the sheep over the withers and down over the shoulder and part of the ribs. A little earlier Mr. Rose had the opportunity of seeing on another property severe fly attack in introduced sheep, whereas there was little fly attack in other sheep on the property. These introduced sheep were affected with the so-called "water rot" condition in an active form.

Thus in this so-called "water rot" we have the same set of conditions as are present about the crutch of ewes, and which leads to normal fly attack. In both cases we have (*a*) moisture, (*b*) surface scales, wool scales, and yolk and (*c*) bacteria, this undesirable alliance leading to decomposition and thereby rendering the part an attraction to the blowfly. In the crutch an additional source of nutriment for bacteria is provided by urine, the decomposition products of which are especially favourable for bacterial growth.

The bacterial decomposition does more, however, than merely attract the fly, as the wool itself is often attacked and injured, so that even when the condition is overcome the wool may be left harsh and wasty. The skin itself suffers to some extent, as the products of this decomposition process cause a scalding effect, leading to additional exudate being given off from the skin itself. This exudate is again decomposed by the bacteria present. Some have ascribed the matting to an excess of yolk, but as the condition is infectious such cannot be the explanation. Yolk itself, however, becomes decomposed by bacteria under the conditions mentioned, and it therefore follows that sheep with heavy-conditioned wool may be more severely affected than those with wool lighter in condition.

It will follow from what has been said that this bacterial rot is most liable to attack those parts of the fleece which are (*a*) easily wetted, (*b*) remain moist. Thus one sees it chiefly in sheep which are open in the wool about the withers and back, and the matting and discolouration occur most commonly just in front of and about the withers, the back and to some extent on the sides. The belly wool certainly may, especially in sheep in long grass, remain wet for a long time, but it must be remembered that the moisture there drains away from the skin and the bacteria are therefore carried to the tip in the case of the wool over the belly. There they lack the warmth provided by the skin in the case of wool on the back and withers, and bacterial growth is therefore not so common on the belly, though the wetting frequently results in the locks becoming "stringy." Owing to the greater density of the wool assisting in the retention of moisture Merinos are more liable to be affected, but cross-breds and even longwools may at times exhibit the complaint.

If the arguments adduced are sound it will follow that when the fleece dries the so-called "water rot," really a bacterial rot, will cease (from lack of moisture), and this is what we find. With the advent of dry weather the discolouration and matting lifts from the skin and clean healthy wool appears beneath the definite line of matting. This also shows that the trouble is confined to the wool itself and is not a disease affecting the wool follicles. With succeeding rains, however, the bacteria are carried down to the skin and the process may be repeated. Thus, when examining affected sheep in midwinter, one may see two or three distinct bands of matting and discolouration running across each lock and each corresponding to a fall of rain.

Opened Fleece of Sheep Showing So-called "Water-rot."
Note discoloured band running through wool about half an inch from skin, with clean wool underneath.

It will naturally follow from what has been said that this condition and this type of blowfly attack will occur most commonly in the districts of high rainfall, *e.g.*, Southern and Northern Tablelands, but it is by no means confined thereto, and during the past few months has been present in certain western areas which have experienced exceptional rains followed by humid conditions.

The following notes by Mr. L. F. R. Bell regarding strikes seen at Nyngan during May and June exemplify this point:—

> Heavy rain fell on 13th May, and was followed by very mild sultry weather. Sheep became struck on the back five days later. The site of strike varied from the crest of the withers to the saddle, the withers being the commoner site. Before strike the wool over the withers was observed to be matted in a moist caked mass, and the entire length of the staple was stained with a substance similar to the so-called "condition" or yolk, which left the wool a brownish colour. The skin of the affected site was in some cases scalded and sore with the skin inflamed and small scabs present. In those sheep not struck the matted portion grew away from the skin, but the wool so affected became harsh and unattractive.

A further report from a nearby district stated that discoloured wool was common, this including green wool.

Whilst the above types of "water rot" are associated with bacteria of various kinds there exists a somewhat similar condition due to a mould. This is the disease known as mycotic dermatitis or lumpy wool, described in the *Agricultural Gazette* for April, 1929. In this case the causative mould or fungus actually invades the wool follicles and produces an exudation, resulting in the formation of hard masses like dried cheese in the wool. Weather conditions again play an important part, for the mould is able to grow only when the skin is kept moist. During dry weather the exudate lifts from the skin, but with subsequent rains the mould grows down on the skin again and fresh exudate is formed. Continued wet conditions lead to softening of the exudate matting the wool and this then becomes attacked by other bacteria (of the types seen in "water rot") and assumes a soft pasty appearance. At this stage it is liable to be attacked by fly. In cases where large areas are affected a large mass of lumpy wool—resembling a scab—may come away leaving an area of raw skin, and such an area also is prone to be attacked by fly.

Opened Fleece of Sheep Showing Green Discoloration.

Note that clean sound wool has grown since. The discoloration forms a band half an inch from skin and extending outward for about three-quarters of an inch.

Whilst fly attack in the crutch or on the back is more common the undersurface of the neck and particularly the neck folds do not necessarily escape. In the case of sheep in long damp feed the wool of the neck is kept continually wet and if flies are prevalent this area also is liable to be attacked.

A perusal of the predisposing factors mentioned in the list given for other types of blowfly attack of abnormal form will show that in each case there exist substances readily attacked by bacteria. It may be blood in a wound; it may be pus underneath a partly lifted scab; it may be a raw surface; or again it may be some discharge, such as that from the womb. Bacteria attack these and lead to the production of substances which attract the fly.

Animal matter whether it be wool, skin scales, yolk, sweat, blood, pus or muscle is composed largely of nitrogenous substances, and these are readily attacked by bacteria. The only other requirement is moisture. When, therefore, all three are present, decomposition goes on and the products of such decomposition attract the fly. Therefore, though situation of strike may vary, the essential causes are the same.

Prevention and Control.

As far as the sheep is concerned the aim must be to try and prevent the conditions which favour this bacterial decomposition. Crutching does this and we all know the good results that follow. By the selection of sheep to eliminate those showing excessive wrinkling much might be accomplished. Dressing of wounds with antiseptic preparations leads to rapid healing and minimises fly attack. Marking lambs young results in smaller wounds and less trouble from fly. The bacterial rot ("water rot") could easily be controlled if it were possible to get the sheep dry. Housing would, of course, do it, but is not practicable. Sheep so affected, especially those with the disease in an active state, should be kept away from healthy stock lest they transmit the diseases to them. When it comes to shearing, these stained wool sheep should be shorn last, so as not to spread the matted material (largely bacteria) about the shed.

Investigations are at present being undertaken as to the best type of dip to use in order to kill these wool discolouration bacteria. They can be killed by antiseptics, but one difficulty is to get dips powerful enough to do this and yet not damage the wool or injure the skin of the sheep. If only individual sheep are affected the animals might well be killed and the pelts burnt. If the pelts of affected sheep are removed they should be dried in some place to which sheep do not have access, as the matted material in the wool easily goes to powder and so the causative bacteria may be spread.

* * *

NOTE.—Since the above was written we have received material from several districts showing that lambs only a few weeks old may be quite extensively affected with mycotic dermatitis and sometimes by "water-rot" due to other organisms. In these cases the wool becomes matted over the greater part of the back and sides. Where mycotic dermatitis is present the skin becomes hardened in addition to the wool. In such cases scabby material lifts and fissures form, and were flies prevalent these lesions might readily be attacked. There is no doubt that the exceptional, wet conditions have been responsible for these lesions. (H.R.S.—10-7-31.)

LETTERS of appreciation of the recently-issued booklet, "Tree Planting on the Farm," by R. H. Anderson, have reached the Department from practically every society in New South Wales that is interested in forestry work. Copies are obtainable from the Department, Box 36A, G.P.O., Sydney, or from the Government Printer, Phillip-street, Sydney. Price, 1s. 2d., including postage.

Fodder Conservation Competitions, 1931.

INLAND DIVISION CHAMPIONSHIPS.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.

THE number of societies conducting competitions in inland districts was only one less than the previous year, and general enthusiasm in no way diminished. Three competitions were conducted in the Central South-west Division, one in the Riverina, and four in the North-west Division: unfortunately no competitions were organised in the Middle-west Division, where, prior to last year, a good measure of support was given to these competitions.

In consequence of the very severe drought which prevailed throughout the year 1929, and particularly during the summer of 1930, it was necessary to resort to the hand-feeding of stock for a considerable period, and fodder reserves were either exhausted or greatly reduced. Last season, however, was favourable for the production of fodder and permitted stocks to be replenished, and it is gratifying that very satisfactory competitions could be conducted by eight societies, and that the winners in four of these competitions had already accumulated sufficient fodder for the feeding of their sheep for the duration of another severe drought. Rather than attempt to conserve sufficient fodder in one year, it is generally regarded as more economical to accumulate reserves gradually, making full use of any surplus growth, and converting into silage wild oats and self-sown wheat which would otherwise waste after a flush season, but owing to the very low prices for grain and hay an opportunity was presented last year for building up reserves at a minimum of expense.

The conditions and scale of points for judging the competitions were as follow:—

Fodders Eligible for Conservation to be—Concentrates (including all grains); or roughage—as hay (e.g., lucerne, oaten, wheaten, barley, clover, grass), straw, or silage, and any other fodder suitable for conservation; to have been produced on the land owned, leased or held on shares by the competitor. No farmer or grazier whose holding consists of less than 150 acres will be eligible to compete.

SCALE OF POINTS FOR JUDGING—AREAS OTHER THAN COASTAL.

		Points.
1. *Suitability and quality of fodder*		60
(*a*) Judged according to suitability of fodder or combination of fodders for the purposes for which they are required	25	
(*b*) Judged as to appearance, apparent palatability, and nutritive and feeding values	35	
2. *Location and protection*	...	45
(*a*) Locality—location of the site, having regard to fire, flood, economy in feeding, and general access	10	
(*b*) Protection—protection from weather, pests, stock, fire, and general deterioration	35	

SCALE of Points for Judging—Areas other than Coastal—*continued.*

	Points.
3. *Economy of production*	15
Including land value, production, storage, and feeding costs.	
4. *Carrying capacity*	60
Quantity for requirements of competitor's holding to be based on the sheep carrying capacity of the holding (when improved and under natural pasture). The maximum amount considered to be competitor's requirements per sheep to be—5 cwt. lucerne hay or its equivalent in feeding value (1 cwt. lucerne hay = 1¼ cwt. cereal hay = 3 cwt. silage = 4 cwt. straw = ½ cwt. grain).	
Total	180

Central South-west and Riverina Championship.

For the purposes of the championship competition, the Riverina was combined with the Central South-west Division, the agricultural societies represented being Ariah Park, Grenfell, Murrumbidgee (Wagga), and Young.

Judging was commenced on 5th and completed on 7th May, and resulted in the following awards:—

TABLE of Awards, Central South-west and Riverina Championship.

Society.	Competitor.	Suitability and quality of fodder.		Locality and protection.		Economy of production	Carrying capacity.	Total.
		(*a*)	(*b*)	(*a*)	(*b*)			
Ariah Park ...	D. W. Edis, "Prestonville," Ariah Park.	21	32	8	34	13	60	168
Murrumbidgee	T. V. and R. L. Brunskill, "Inglewood," Forest Hill, via Wagga.	21	31	8	29	11	60	160
Grenfell ...	H. Sweeting, "Corowood," Grenfell.	18	30	8	29	11	60	156
Young ...	G. H. Coddington, "Rosebank," Kingsvale.	17	27	7	27	11	35	124

The initial effort of the Ariah Park society in conducting a fodder conservation competition has been rewarded with success, the championship being won by Mr. D. W. Edis with a very fine exhibition of conserved fodders consisting of silage, cereal hay and grain, which was outstanding as regards the quality of the fodder and the efficiency of its protection. His property is 820 acres in area, of which 410 acres were cropped with wheat last season, 220 acres with oats, 20 acres with barley, 4 acres with field peas, 10 acres with Sudan grass; 15 acres are under lucerne and 100 acres are fallowed, leaving only about 26 acres of natural pasture.

The stored fodders comprised 162 tons of silage of good quality conserved in a well-crowned pit, of which about one-third was a mixture of oats and peas, one-third a mixture of oats and lucerne, and the balance wheat and black oats; two stacks of oaten hay of excellent quality, aggregating 145 tons, one of which was built on a high stage, rendered mouse-proof with inverted petrol tins, and the other on a timber foundation surrounded with a mouse-proof fence of galvanised iron, the joints being well capped; both stacks were very well built and thatched, tie-wire being substituted for twine in thatching to render the thatching more permanent. In a large galvanised-iron grain silo 58 tons of oats were stored safe from any deterioration. The total quantity of fodder is sufficient for the feeding for nine months of 1,067 sheep, which is considerably more than the estimated carrying capacity of the holding.

An excellent demonstration of intelligent management of a mixed farm has been provided by Mr. Edis. Although his farming operations are confined chiefly to the production of cereal crops and there are only 26 acres of pasture, he is able to carry stock equivalent to nearly a sheep to the acre. This has been achieved by the cultivation of fodder crops for grazing, backed by the security provided by the large fodder reserves.

The conserved fodders of the second prize winners, Messrs. T. V. and R. L. Brunskill, of "Inglewood," Forest Hill, via Wagga, consisted chiefly of cereal hay. The area of their property is 2,100 acres, of which 640 acres were devoted last year to the cultivation of cereal crops, 70 acres to fodder crop of mixed oats, and lucerne; 270 acres are under lucerne, 770 acres fallowed, and the balance of 350 acres is natural pasture. Included in the reserves of fodder were twenty-two haystacks, of which eleven were oaten hay, nine wheaten hay, and two lucerne hay, which, taken in conjunction with 120 bales of oaten hay and 665 bags oaten and wheaten chaff, amounted to a tonnage of 1,217 tons of cereal hay and 40 tons lucerne hay. In addition there were 36 tons of grain in bags, the bulk of which was wheat and the balance oats. Nine of the stacks of cereal hay, which were situated in a row in the corner of a paddock, were very well built on timber dunnage and methodically thatched and fenced against stock; the balance of the stacks were well distributed over the holding and built on a foundation of straw, and with two or three exceptions were neither thatched nor fenced. All stacks were open to possible infestation by mice. The baled hay, chaff, and grain were stored in sheds and thus protected from the weather. The total quantity of fodder greatly exceeded the requirements and the quality throughout was very good, but the proportion of lucerne hay was much too low for the purpose of feeding a balanced ration.

The third prize was awarded to Mr. H. Sweeting, of "Corowood," Grenfell. Of his property, 1,340 acres in area, 500 acres were cultivated last year with cereal crops; 55 acres are under lucerne, 300 acres fallowed, and the balance of 385 acres is pasture land. The conserved fodder was confined to cereal hay and grain, a total of 197 tons of the former and 100 tons of the latter. The hay was contained in two stacks, which were well thatched and fenced; some was in a hay shed and chaff in a chaff room. The bulk of the grain was stacked in the open on a timber foundation with a temporary galvanised-iron roof, fenced against big stock with a barbed wire fence, and protected from the ravages of mice with a galvanised-iron enclosure. In the aggregate the quantity of fodder was just sufficient to meet the needs of the number of stock the property was estimated to carry for a period of nine months. The quality of the fodder was good, but it was lacking in variety.

The North-west Championship.

The four societies in the North-west Division which competed last year again organised competitions, namely, Boggabri, Gunnedah, and Wee Waa agricultural societies and the Manilla Farmers and Settlers' Association. Judging occupied three days, from 13th to 15th May, and the following are the details of the awards:—

TABLE of Awards, North-west Championship.

Society.	Competitor	Suitability and quality of fodder.		Location and protection.		Economy of production	Carrying capacity	Total
		(a)	(b)	(a)	(b)			
Wee Waa ...	G. F. Gray, "Hawthorne," Wee Waa.	18	31	9	32	12	60	162
Boggabri ...	S. K. Rabbitts, "Nandewar," Boggabri.	23	28	7	29	13	57	157
Gunnedah ...	Norrie Bros., "Strathmore," Mary's Mount.	18	29	8	28	13	47	143
Manilla ...	A. Nixon, "Oakhampton," Upper Manilla.	22	27	7	28	12	10	106

In carrying off the championship Mr. G. F. Gray, of Wee Waa, has repeated his success of the previous year Only 305 acres are cultivated on the property of 1,856 acres, and fodder reserves were confined to cereal hay and grain. Nearly the whole of the hay, both oaten and wheaten, was in bales, and the total quantity, amounting to 420 tons, was stored in four large hay sheds, which provided effective protection against weather, stock, rats, and mice. The grain, which was chiefly wheat, totalled 30 tons and was stored in a granary built on piles and well capped to render the building mouse-proof. The total weight of fodder exceeded the requirements for providing nine months' ration for the 1,102 sheep which the property was estimated to carry. The fodder generally was of excellent quality, but was lacking in variety; the absence of a high protein fodder to form a combination that would provide a balanced ration was the main deficiency, but otherwise the exhibit was most creditable.

The second prize was again won by Mr. S. K. Rabbitts (Boggabri Society), who has considerably increased his fodder reserves since the previous year. On this holding of 2,500 acres, which has a 6-miles frontage to the Namoi River, 465 acres have been cultivated with wheat, lucerne being sown with the wheat crops, 52 acres with rape, and 28 acres are under lucerne. The greater proportion of the fodder was silage of good quality, consisting chiefly of Saccaline and Sudan grass contained in ten pits, and lucerne silage in two stacks, totalling in all 765 tons. There were also cereal hay and chaff, principally wheaten, amounting to 316 tons, lucerne hay 68 tons, and grain 30 tons. Most of the hay has been baled and stored in sheds or stacked and thatched. The fodder is located in scattered positions over the property and generally well protected from the weather and stock, but provision had not been made to prevent the cereal hay being damaged by mice. The total quantity of fodder was nearly sufficient to supply the requirements of the 2,500 sheep, which was the estimated carrying capacity of the property. A variety of fodders was available which was capable of providing a satisfactory ration for the stock.

The fodder submitted by Messrs. Norrie Bros., of Mary's Mount (Gunnedah Society), who secured the third prize, included 252 tons of oaten silage of very good quality in three pits, 205 tons cereal hay in nine stacks, the quality of which varied from fair to good, and 15 tons of grain. This was sufficient for feeding 1,003 sheep, which was below the requirements for the number of sheep estimated on the carrying capacity of the 1,700 acres at three sheep to 4 acres.

Grand Championship of Inland Division.

Competitors who have previously won two championship competitions are disqualified for competing in further championships, and provision has been made for a grand championship for the inland districts, in which they can compete against the winners of the championship competitions in each division. This year there was no competitor so qualified who was prepared to challenge the champions for the supreme honour of grand champion, so this was decided on the points awarded in the championship competitions.

The distinction was thus gained by Mr. D. W. Edis, of Ariah Park, with a margin of six points from Mr. G. F. Gray, of Wee Waa, who won the grand championship last year. Mr. Edis is to be congratulated on attaining to this honour at his first attempt in these competitions.

General Comments.

As every competitor included cereal hay and grain in his fodders, and three of them without any other supplementary fodder, it may be taken that this form of conservation is the most popular in inland districts. One advantage of cereal hay over silage is that any surplus above a competitor's requirements has a market value, but it requires to be protected from fire, weather, stock, mice and rats, each of which is otherwise likely to account for the deterioration of the fodder, and it is wise also to have it covered by insurance against loss by fire. Cereal hay thus requires a greater expenditure in its conservation than does silage, for once the pit is filled and covered it is safe from depreciation without any further expense being incurred.

A further advantage of silage was demonstrated in that the fodder is not damaged by rains during the harvesting period. The whole of the silage inspected was of good quality, but much of the hay was discoloured and depreciated in quality as the result of rains at harvest time. The winners of the two championships were the only competitors who had provided adequate protection of their cereal hay and grain against infestation by mice. In view of the reports that mice are on the increase in some inland districts, it is advisable to take precautions to prevent damage by these rodents. It is a problem to render stacks absolutely mouse-proof; straddles or stages constructed at least 3 feet from the ground, and the posts capped to prevent mice climbing, are very effective, provided care is taken that straws, sacks, or other articles are not allowed to hang down and give mice a chance of climbing into the stack. The initial cost of construction is appreciable, but they have the advantage of being permanent The more general practice is to surround the stacks with a fence of galvanised iron (either plain or corrugated), which should slope outwards, and the joints between the sheets of iron should be capped, for mice can here obtain a foothold and climb the fence. It will be necessary, when mice are prevalent, to inspect the fence from time to time to make sure that the mice are not burrowing underneath. In the case of permanent hay sheds, it is an advantage to set the iron in concrete.

For the effective protection of grain from the ravages of mice, nothing can compare with the galvanised-iron silo. As a rule, oats (which is the most suitable grain for conserving in inland districts) are cheap at harvest time, but usually advance in price towards the end of the year, and there are instances where the cost of the oat silo has been returned in less than a year as the result of the increase in the value of the oats during the period they were stored.

On the farm of Messrs. Norrie Bros., Mary's Mount, some silage was inspected which had been made in the prolific season of 1926 at very little cost from black oats and herbage which had grown in a cultivation paddock. The silage was of excellent quality and the bulk of it had already been fed to sheep during dry periods, with good results. In the present favourable season a luxuriant growth of self-sown wheat, black oats, and herbage has sprung up, and a large volume of valuable fodder will be available for conversion into silage, merely for the cost of harvesting and pitting, and it behoves farmers generally not to allow the opportunity to pass of conserving this fodder at such a small outlay.

INFECTIOUS DISEASES REPORTED IN JUNE.

THE following outbreaks of the more important infectious diseases were reported during the month of June, 1931:—

Anthrax	1
Blackleg	9
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	9
Swine fever	Nil.
Contagious pneumonia	1
Necrotic enteritis	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

Select Seed Maize Now.

L. S. HARRISON, Special Agricultural Instructor.

AN important phase of maize production at this time of the year is the selection of seed, particularly in the case of prospective competitors in the maize-on-the-cob classes at next year's R.A.S. Sydney Show.

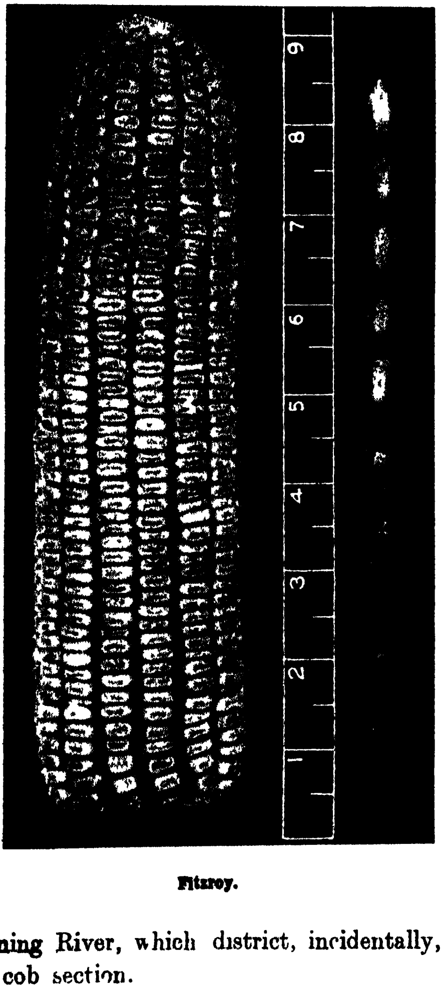
The 107 exhibits at the last Royal Show were of a very high standard. These classes have been arranged with the idea of providing for definite standardised varieties suitable for the different maize growing areas of the State.

In the Fitzroy section—Fitzroy is the most widely grown variety in the State—there were fifteen entries. Mr. J. G. Stitt won first prize, and Mr. L. M. Stitt was second Both these growers are on the Manning River, and the cobs they submitted were of excellent type and quality.

These two competitors occupied similar positions in the Large Red Hogan section, in which there were eight exhibits. The winning cobs were of very satisfactory colour and shape, an attainment of some difficulty in this variety.

The Leaming class atrracted twelve entries and the prizewinners were the same two competitors, but with positions reversed. Leaming is a decidedly popular variety, and the quality of many of the cobs in this section was particularly good, both in regard to type, cob uniformity and excellent depth of grain.

Golden Beauty, with ten entries, showed a slight falling off in quality. The prizes went to Messrs. J. C. and J. G. Stitt, Manning River, which district, incidentally, took almost all the prizes in the cob section.



Fitzroy.

There were ten entries in the Golden Superb class, in which Mr. S. Flett and Mr. L. M. Stitt came first and second, respectively. This class was exceptionally well represented, many of the exhibits showing excellent colour as well as uniformity in grain and cob.

Mr. J. C. Stitt first, and Mr. J. G Stitt second, were the placings in the Funk's Yellow Dent section, which attracted ten entries. The best of the exhibits were very satisfactory as to excellence of uniformity and type.

The Pride of Hawkesbury class attracted six entries and competition was strong. Type and uniformity, generally, were high. The winner, Mr. J. C. Stitt, was also awarded the Championship in the cob classes for his entry in this section. Mr. J. G. Stitt was runner-up.

In the section for "Any Other Yellow Variety," Mr. S. L. Cox, with Large Yellow Horsetooth, was placed first, and Mr. L. M. Stitt second, with Manning Pride. Competition was also very strong in this section, in which there were fourteen entries. Mr. Cox's entry comprised cobs of high quality and of excellent size and uniformity.

"Any Other White" attracted eight entries, with Mr. A. Abbott first, with Manning Silvermine, and Mr. W. E. Ward second, with Giant White. This section was not outstanding for quality. In Early Clarence, Hickory King and Iowa Silvermine, the entries, four, five and five, respectively, were rather low.

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—C. G. SAVAGE, Director of Fruit Culture.

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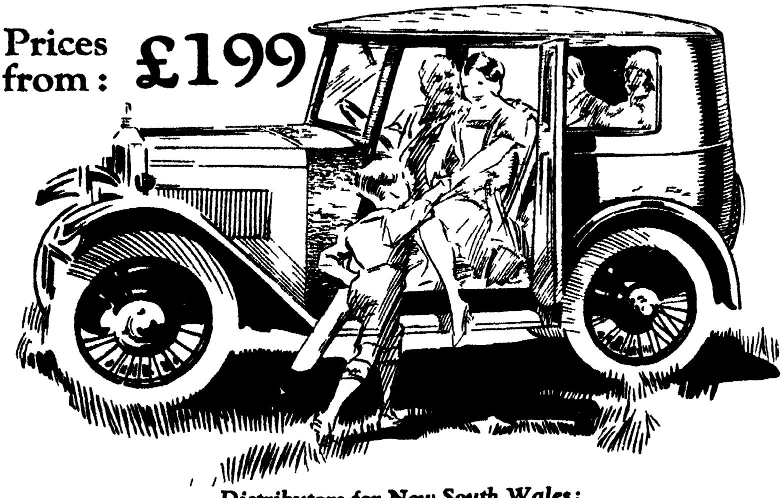

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Varieties of Wheat in New South Wales.

[Continued from page 546.]

J. T. PRIDHAM, H.D.A., Plant Breeder, and A. R. CALLAGHAN, D. Phil., B.Sc., B.Sc.Agr., Assistant Plant Breeder

THIS is the last instalment of this article, and, as in previous issues, the varieties are dealt with in the order of their importance in New South Wales at the time of writing. A complete list of the varieties dealt with in this series reads as follows:—Waratah, Federation, Yandilla King, Turvey, Canberra, Nabawa, Bena, Marshall's No. 3, Penny, Hard Federation, Union, Free Gallipoli, Nizam, Currawa, Gresley, Wandilla, Ranee, Riverina, Cleveland, Purple Straw, Aussie, Bomen, Major, Gluyas Early, Minister, Bald Early, Florence, Clarendon, Early Bird, Steinwedel, Comeback, Ford, Gullen, Queen Fan, Caliph, Pusa 4, Burrill, Duchess, Exquisite, Sepoy, Sultan, Bredbo, Bogan, Baringa, Barwang, Carinda, Cookapoi, College Purple, Dundee, Droophead, Silver Bart, Onas, and Zealand.

Barwang.

Barwang was selected at Cowra in 1915 from the progeny of a plant which, it is thought, resulted from a natural cross between Hard Federation and Gresley.

It is of mid-season maturity with medium-strong, tall, white straw. The ears are white, long and tapering with tip awns; the outer glumes of this variety are distinctive, being short with very broad oblique shoulders, and extremely short blunt beaks. The grain is of medium size and is classed as medium strong.

Barwang is susceptible to flag smut and stem rust

Carinda.

Carinda was originated by Farrer from the cross Cleveland x Talavera x Gilgandra, and fixed since his time.

It is a late-maturing variety that tillers well; it has tall, white straw of only medium strength. The bold, white ears are medium dense, only slightly tapering and bear tip-awns. The outer glumes of the spikelets are long and narrow with elevated shoulders; the beaks are long and acute. The white grain is ovate and hard; it is classed in the medium-strong flour class.

It is susceptible to flag smut, stem rust, leaf rust, and foot-rot, and is also reported as liable to shatter under certain conditions. Although it has yielded well at Bathurst in comparison with Cleveland, the above defects indicate that it is of little value in comparison with other late maturing varieties.

Cookapoi.

Cookapoi resulted from a cross between Bunge and Canberra, made by Mr S Plowman, of Parkes.

This variety, being very early in maturity, stools sparsely The straw is of medium height and fineness; it is not very strong, but stands better than Canberra The ears are short, brown, tip-awned, and tapering The outer glumes of the spikelets are long, medium wide, with medium broad shoulders, which are oblique in the lower spikelets, but inclined to be rounded towards the middle and tip of the ear. The grain is of a deep yellowish hue, and elliptical; it is included in the medium-strong flour class.

Barwang.

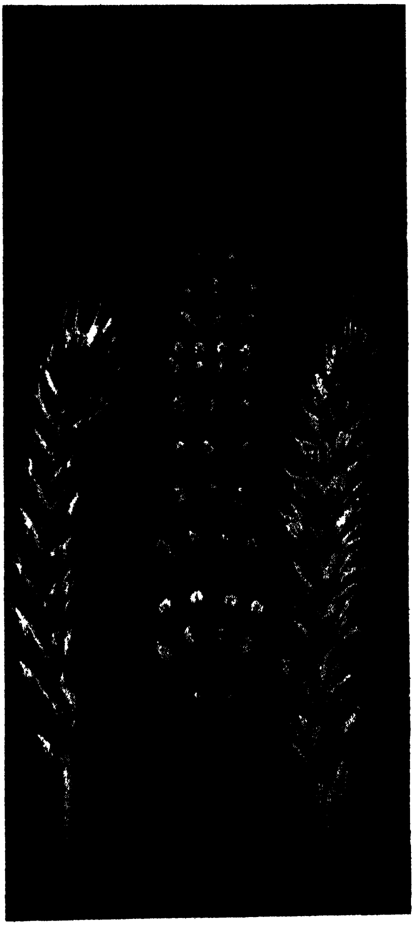
Carinda.

Cookapoi is moderately resistant to flag smut, but susceptible to both stem and leaf rust. In the last few seasons it has demonstrated its drought resistant qualities; it has done especially well under the dry conditions at Trangie and Condobolin. Its very early maturity decreases its value for the more favoured areas of the wheat belt.

College Purple.

College Purple originated at Dookie Agricultural College, Victoria, where it was selected by Mr. Pye. It is the result of a cross between Purple straw and a Fife-Indian wheat.

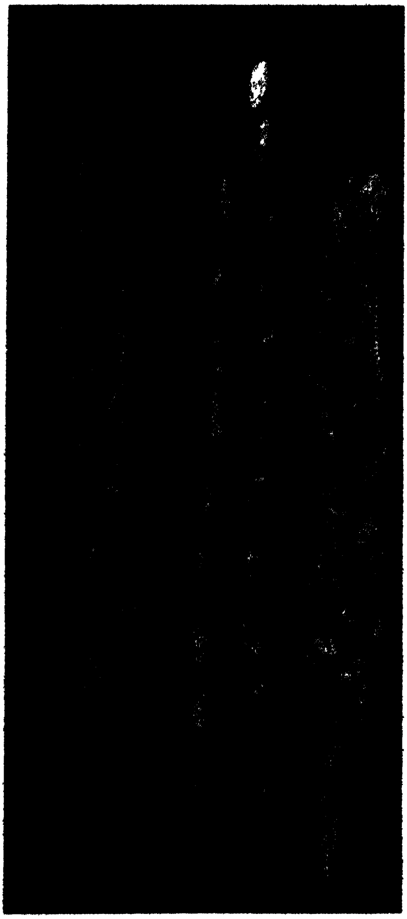
Cebkapol.



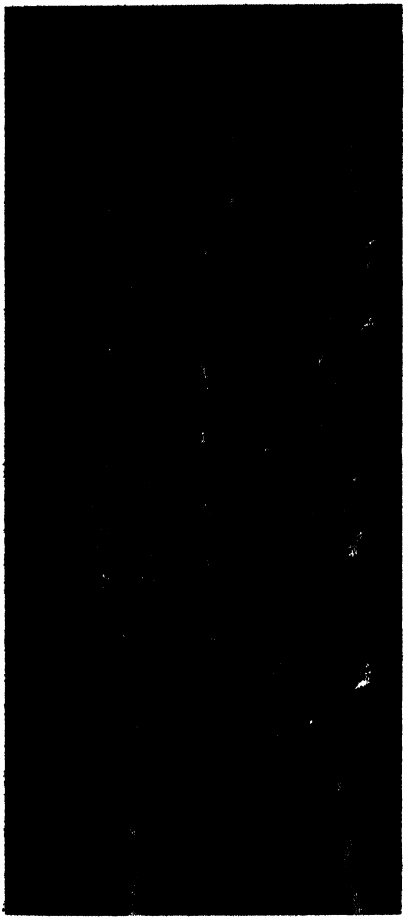
College Purple.

The variety grows to a moderate height and has brittle, purple-tinted straw; it is liable to lodge if left standing for long after the crop ripens. The bold, white ears of the variety are narrowly clubbed and tip-awned; the outer glumes of the spikelets are of medium length, with square shoulders and sharp long beaks; the latter characters contrast with the rounded shoulders and short blunt beaks of the old Purple Straw variety. The grain is large, soft, and often pitted; it is classed in the weak-flour group.

College Purple is a dual-purpose wheat, mid-season to late in maturity, and, although productive in a favourable season, it lacks hardiness. It is susceptible to stem rust and flag smut. A few years ago it was grown to some extent in New South Wales, but it has been replaced by hardier, more disease-resistant varieties.



Dundee.

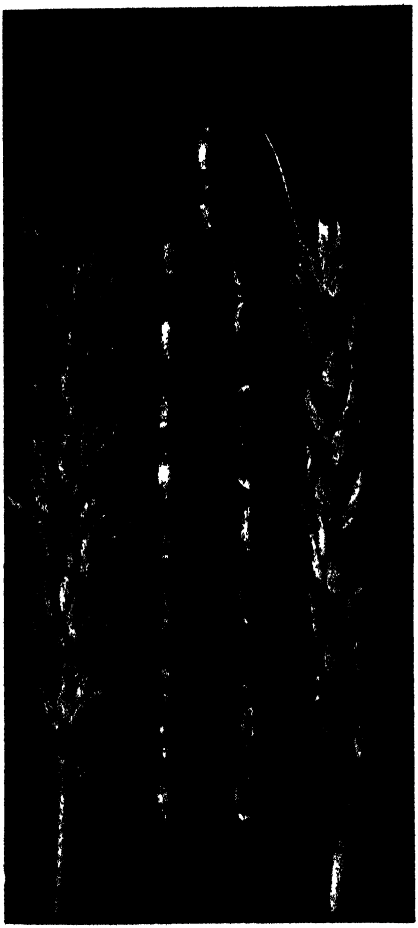


Dreephead.

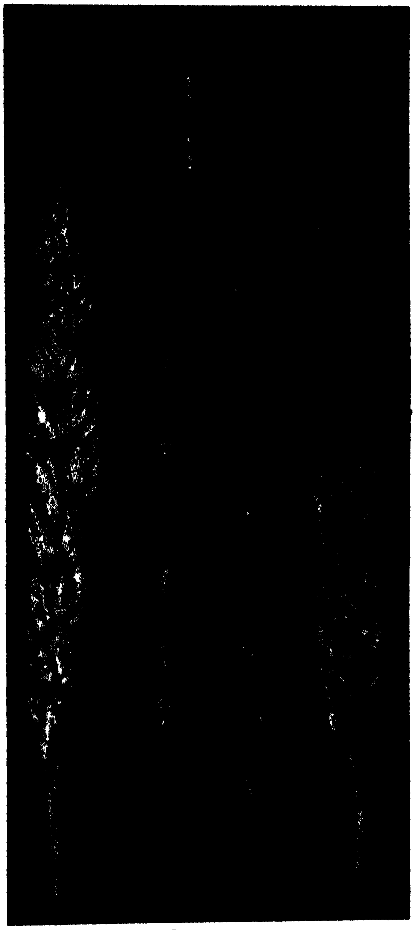
Dundee.

Dundee was raised from the cross Hard Federation x Cleveland x Sands made at Cowra in 1919; the Sands parent is a selection from Hard Federation.

This variety has strong, rather coarse straw of medium height, standing well, even under adverse circumstances. The ears are attractive, moderately dense, brown and tip-awned. The spikelets are large and compact, directed uniformly, and often set four grains; the outer glumes are wide, with broad, square shoulders, with a slight elevation on those of the upper spikelets; the beaks are very narrow and acute. The grain is of good quality, fairly hard and horny; it is included in the medium-strong flour class.



Silver Bart.



Onas.

Dundee is a variety with excellent standing ability, it holds its grain well, and appears to be fairly drought-resistant. It is resistant to flag smut, but susceptible to stem rust. Being of mid-season maturity, its general characters, combined with disease resistance, make it a strong competitor with Federation, Bena and Union in districts where these varieties are largely grown. It is one of the most promising wheats recently bred in New South Wales.

Droophead.

Droophead was first grown in the Manilla district, and was supposed to have originated in South Australia. From its milling characteristics and its appearance in the field it is thought to be a selection from Budd's Early; it is not related to Federation, though sometimes erroneously called "Droophead Federation."

Zealand.

It has tall, medium-strong straw, rather brown in colour. The ears are long, tapering and brown, conspicuously tip-awned and with an exaggerated habit of nodding over, even prior to ripening. The outer glumes of the spikelets are short and wide with broad square shoulders. In grain quality it is included amongst the weak-flour wheats.

Droophead is a mid-season variety, susceptible to stem rust and to flag smut. It is very liable to shatter and has little to commend it for general culture.

Silver Bart.

Silver Bart was bred by Mr. R. Marshall, of South Australia, from a cross between Silver King and Bartlett's crossbred.

It has tall, white, medium-strong straw of good quality, very suitable for hay and chaff purposes. The white tapering, tip-awned ears usually droop over noticeably when ripe; they are distinctly lax and narrow. The outer glumes of the spikelets are long and medium wide, with broad rounded shoulders throughout and long sharp beaks. The large, medium-hard, white grain is elliptical.

Although susceptible to flag smut and stem rust, Silver Bart has drought-resistant qualities and good grain-holding characters. As a dual-purpose, early-maturing variety under dry conditions this variety promises well.

Onas.

Onas is of South Australian origin; it was bred by Mr. F. Coleman from a cross between Federation and Tarragon; the latter parent is a wheat of the same description as Cleveland.

This variety has short straw and an erect habit of growth not unlike Federation and Union, but its straw is more brittle. Except that they are white, the ears of Onas resemble those of Union very closely, and in the green condition it is difficult to distinguish one variety from the other. Generally the ears of Onas are more full-tipped than those of Union, otherwise both are bald, with broad square shoulders to the outer glumes of the spikelets. The grain is of medium size; it belongs to the medium-strong flour class.

Onas is susceptible to flag smut and stem rust, and is liable to shatter its grain if left standing long after ripening. It is a late-maturing variety which has yielded satisfactorily for many years in New South Wales, but its performances are not sufficiently good to rival those of the standard variety Yandilla King.

Zealand.

Zealand is the only variety of exotic origin now grown in New South Wales. It was originally imported from France in 1888.

It is a very late, free-stooling variety, with very tall, strong straw of excellent quality for hay and chaff purposes. The very long tapering ears are practically bald, bearing only minor, inconspicuous tip-awns. The spikelets are large and the outer glumes are long with the shoulders rounded to square at the tip of the ear. The grain is large, plump, soft, and dull-white; it is classed in the weak-flour group.

Zealand is moderately resistant to flag smut, but susceptible to stem rust. Its chief value is as a specialised hay wheat in districts removed from the tablelands, but which are not too dry.

(*Concluded.*)

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1931.

Peak Hill (W. Crush)	Aug.	18, 19
Lake Cargelligo (C. W. Hutchens)	,,	18, 19
Gilgandra...	,,	18, 19
Illabo (J. McCarthy)	,,	19
Galston (W. J Fagan)	,,	21, 22
Condobolin (J. M. Cooney) ...	,,	25, 26
Grenfell (J. M McInnes) ...	,,	25, 26
Ungarie (D R. Redford) ...	,,	26
Wagga (F. H Croaker)... ...	,,	25, 26, 27
West Wyalong (A. Andrew) ...	Sept.	1, 2
Murrumburrah (W. Worner) ...	,,	1, 2
Parkes (L. S. Seaborn)	,,	1, 2
Deniliquin (P. Fagan)	,,	2
Burrowa (S. G Hughston) ...	,,	3, 4
Corowa (H. G. Norton)... ...	,,	4, 5
Barmedman (S. S. Penberthy)...	,,	5
Young (Thos. A. Tester) ...	,,	8, 9
Forbes (E. A. Austen)	,,	8, 9
Cowra (E. P. Todhunter) ...	Sept.	15, 16
Temora (J. M. McInnes) ...	,,	15, 16
Ganmain (W. H. Logan) ...	,,	15, 16
Junee (G. W. Scrivener) ...	,,	22, 23
Canowindra (W. E. Frost) ...	,,	22, 23
Barellan (W H. McRae) ...	,,	23
Singleton (J. T. McMahon) ...	,,	23, 24, 25
Ardlethan (Les Smith)	,,	30
Berrigan (R. Wardrop)... ...	,,	30
Hay (G. C. McCracken)... ...	,,	30, Oct. 1
Canberra (C. R. E. Southwell)...	Oct.	2, 3
Narrandera (J. D. Newth) ...	,,	6, 7
Ariah Park (Mort Collings) ...	,,	7
Quandialla (Stuart Tompkins)...	,,	7
Griffith (M. E. Sellin)	,,	13, 14
Bribbaree (J. Aston)	,,	14
Carcoar (T. G. Stammers) ...	,,	14
Cootamundra (G. B. Black) ...	,,	20, 21

Insect Pests of Vegetables.

A CHART OF CONTROL MEASURES.

W. L. MORGAN, B.Sc.Agr., Assistant Entomologist.

BOTH the home gardener and the commercial grower of vegetables are constantly faced with the problem of controlling the various insects, mites, etc., which attack their crops. The majority of pests can be controlled readily and losses that frequently occur prevented, but indiscriminate treatment is useless. The first step in plant troubles, as in human ones, is diagnosis, but a knowledge of the enemies to be treated and of the remedies found to be most effective, of the preparation of these remedies, and of the proper time for their application, is also necessary. It is the purpose of this chart, therefore, to indicate briefly the various pests of vegetable crops, the methods of controlling them, and the correct time for treatment. For a full description of any particular pest, including its life-history and habits, growers should refer to the series of *Insect Pest Leaflets* issued by the Department and obtainable free on application.

Effective treatment calls for the use of good spray outfits and satisfactory materials, and success will only be obtained by thorough attention to details.

When spraying, the use of nozzles suited to the various kinds of sprays and to the result desired is important. External contact insecticides (which term will be explained later) should in most cases be applied in a drenching manner with a coarse nozzle and with as high a pressure as possible; internal poison insecticides can be applied with a fine nozzle as a mist-like spray, and the nozzle need not be held so close to the object. With either type of nozzle, however, thoroughness of application is the most important point.

Two essential points in dusting are— (1) the dusts must be very finely divided, and (2) a suitable blower or dust gun must be used to obtain a light film of dust over the foliage.

The Common Insecticides.

Control measures must be applied to insect pests according to the nature and feeding habit of the pest. Some insects, such as grubs, actually eat parts of the plants, having mouths suited to this purpose, while others (aphids, for example) have a proboscis or beak through which they suck the plant juices, and growers must classify vegetable pests in one or other of these divisions before it is possible to decide upon the most effective control measures.

Internal insecticides (stomach poisons) deposited on the plants are used for those pests which chew their food, while external contact insecticides, which kill by their penetrating, irritating, or suffocating properties, are used for insects with sucking mouth parts.

Stomach Poisons.

These are applied for insects with biting mouth parts, and may take the form of sprays, dusts, or baits.

Sprays.- The spray most commonly used is lead arsenate, while Paris green and calcium arsenate are used to a less extent. Frequently it is necessary to add a spreader to lead arsenate spray, so as to ensure a thorough covering of the foliage. The spreader that is generally recommended is calcium caseinate, which is made by mixing 4 oz. of casein with 16 oz. of lime.

The Dusts.--The dusts are usually lead arsenate or calcium arsenate, mixed with a "carrier" such as kaolin or hydrated lime.

The Baits.—Poison baits usually contain either calcium arsenate or Paris green, mixed with some material, such as bran, upon which the insects will feed.

Contact Insecticides.

These are applied either as dusts or as sprays for the control of insects with sucking mouth parts. Extracts of tobacco are mostly used. Home-made tobacco decoctions may be prepared as described in the *Spray Leaflet* No. 2 issued by the Department, but the commercial extract, nicotine sulphate, is generally preferred. The efficiency of nicotine sulphate is greatly increased by the addition of soap at the rate of 1½ lb. to 50 gallons of spray (*i.e.*, 2 oz. to 4 gallons).

Nicotine sulphate when mixed with lime forms nicotine dust. This dust, which is manufactured commercially, should be applied with the same type of dusting machine as is used for lead arsenate dusting. Extracts of derris and of pyrethrum also are used as contact insecticides against sucking insects and some caterpillars.

Lime-sulphur and atomic sulphur sprays and sulphur dusts are used in controlling mites.

A Vegetable Pest Control Chart.

Crop.	Pest.	What to Use.	When to Apply.	Remarks.
Tomato ...	Fruit caterpillar or maize and tomato moth (*Heliothis obsoleta*).	1. Lead arsenate dust, 50 per cent., or 2. Lead arsenate spray, 20 oz. to 40 gals. water (2 oz to 4 gals.), plus calcium caseinate, 10 oz. to 40 gals. (1 oz. to 4 gals.)	Each week as soon as the small white eggs are observed on the foliage.	Examine plants for presence of eggs from flowering stage onwards. Wipe fruit before using or marketing.
	Stem caterpillar (*Phthorimæa plæsiosema*).	Treatment as for fruit caterpillar. Burn any old plants that are infested.	Each week	Not a serious pest, outbreaks infrequent.
	Cutworms (*Noctuidæ*).	Poison bran bait (1 lb. Paris green 24 lb. bran. 20 oz. molasses or treacle or 10 oz. salt, 3 gals. water).	Distribute bait along rows two or three days before filling in gaps. If replanting, scatter bait broadcast two or three days beforehand.	Cutworms shelter in the soil by day, and feed at night.
	Brown vegetable weevil or elephant beetle (*Listroderes obliquus*).	1. Calcium arsenate dust, 20 per cent., or 2. Lead arsenate dust, 25 per cent., or 3. Lead arsenate spray, 1 lb. to 16 gals. (4 oz. to 4 gals.).	In October and November when beetles or damage are first noticed. More than one application may be necessary.	Weevils shelter in the soil at the base of the plant during the day, and feed only at night.
	Tomato fly (*Lonchæa aurea*).	Prevent damage to the fruit by other insects such as fruit caterpillar.	....	The fly does not infest sound fruit. It is only through cracks or injury to fruit by other insects that it is able to make an entry.
	Aphids or plant lice (*Macrosiphum* sp.).	1. Nicotine dust, 2½ per cent., or 2 Nicotine sulphate (1 in 800) and soap (1¼ lb to 50 gals. of the spray)—equal to 2 tablespoonsful of nicotine sulphate, 2 oz. soap to 4 gals. of water.	Apply the dust during warmest period of day. When infestation is severe a second or third application may be necessary.	Mainly a pest of glasshouse tomatoes.
	Jassids (leafhoppers)	Treatment as for aphids	When numerous	Seldom a serious pest.
	Rutherglen bug (*Nysius vinitor*).	1 Pyrethrum powder, or 2. Calcium cyanide one part. hydrated lime three parts, dusted around base of plants: on adjacent weeds dust with calcium cyanide. 3. Plough under all weeds during winter	During the heat of the day; apply with a dust gun.	Fruit damaged mainly; infestation lasts about a month or even less.
	Green vegetable bug (*Nezara viridula*).	1. Hand picking. 2. Collect egg masses. 3. Dust immature bugs with Pyrethrum powder or spray with strong Pyrethrum extract.	Destroy as many bugs as possible during October and November.	No insecticide yet available that will destroy the adults readily.
	Tomato mite (*Phyllocoptes lycopersici*)	1. Lime-sulphur spray, 1 gal to 80 gals. of water. or 2. Atomic sulphur, 1 lb. in 16 gals. of water, or 3. Sulphur dust.	In the field apply spray when first fruit commences to ripen. In glass-houses commence dusting when the flowers appear and repeat when film of dust has disappeared.	The mite is invisible to the naked eye. Symptoms of attack are silvering and curling of the leaves, a brown discolouration of the stems and a russetting of the fruit in some cases. The attack usually commences on lower leaves and the final result is a shedding of the older leaves, the blossoms and the fruit. Lime-sulphur and arsenate of lead sprays may be mixed and applied together, but several days should elapse after Bordeaux spraying before applying lime sulphur.

A VEGETABLE Pest Control Chart—*continued.*

Crops.	Pest.	What to Use.	When to Apply.	Remarks.
Potato ...	Potato moth (*Phthorimaea operculella*).	1. Use clean seed. 2. Cultivate to keep tubers covered completely with soil. 3. Bag and sew immediately after digging. Do not place stalks over mouths of bags before sewing. Store in bin, tank or airtight room, if in an open shed cover with tarpaulin or sacking. 4. Fumigate infested tubers for twenty-four hours, using 5 lb. of carbon bisulphide liquid to 1,000 cubic feet of space.	Exercise care at all stages—in the use of seed, during the growth of the crop, at digging and in storage.	The potato moth attacks the growing plants in the field as well as the tubers themselves.
	Brown vegetable weevil or elephant beetle (*Artroderes obliquus*).	1. Lead arsenate dust, 25 per cent., or 2. Calcium arsenate dust, 20 per cent., or 3. Lead arsenate spray, 1 lb. to 16 gals. of water (4 oz. to 4 gals.).	In October and November when beetles commence their attack.	The beetles feed only at night, and shelter in the soil during the day.
	Cutworms (*Noctuidæ*)	Poison bran bait (1 lb. Paris green, 24 lb. bran, 20 oz. molasses or treacle or 10 oz. salt, 3 gals. water).	Only in season when severe outbreaks of cutworms occur. Treat as soon as large numbers of cutworms are found in the soil. Broadcast bait over infested patches or scatter along the rows.	Cutworms shelter in the soil by day and feed at night.
	Flea beetles (*Halticidæ*).	1. Lead arsenate dust, 25 per cent., or 2. Calcium arsenate dust, 20 per cent., or 3. Lead arsenate spray, 2 lb. to 40 gals. of water (3 oz. to 4 gals.)	Only necessary to treat if an infestation becomes severe.	The beetles hop in a manner similar to fleas.
	28-spotted ladybird beetle (*Epilachna 28-punctata*).	1. Lead arsenate dust. 25 per cent., or 2. Lead arsenate spray 2 lb. to 40 gals water (3 oz to 4 gals.).	Two applications with an interval of ten days	Spray less effective than the dust.
	Jassids or leaf hoppers (*Jassidae*).	1. Nicotine dust, 2½ per cent., or 2. Nicotine sulphate (1 in 800) plus soap (1½ lb. to 50 gals. of spray)—equal to 2 table-spoonsful of nicotine sulphate, 2 oz. soap to 4 gals. of water.	Treat twice with an interval of a fortnight. Apply the dust during warmest period of the day.	....
Sweet potato...	Sweet-potato hawk-moth (*Herse convolvuli*).	1. Arsenate of lead dust. 20 per cent., or 2. Calcium arsenate dust, 20 per cent., or 3. Arsenate of lead spray, 20 oz. to 40 gals. of water (2 oz to 4 gals.).	Only if pest is numerous.	....
	Sweet-potato weevil (*Cylas formicarius*)	1. Clean seed rotation of crops, clean cultivation. 2. Arsenate of lead dust, 50 per cent., or 3. Arsenate of lead spray, 20 oz. to 40 gals of water (2 oz. to 4 gals.) for adults feeding on leaves.	Take steps to control pest immediately it appears.	....

A VEGETABLE Pest Control Chart—*continued.*

Crop.	Pest.	What to Use	When to Apply	Remarks
Pumpkin Melon, Squash and Cucumber	Pumpkin beetle (*Aulacophora olivieri*)	1 Plant excess of seed to provide for loss by beetle attack 2 Dust with hydrated lime or with lime and tobacco dust equal parts for the first two or three weeks after the plants come through the ground, thereafter 3 Dust with 50 per cent arsenate of lead dust or spray with arsenate of lead 3 lb to 50 gals of water (3 oz to 4 gals of water)	Give particular attention to plants on warm calm days following wet or windy weather	Wood ashes are too easily blown off the plants and moreover can only be applied when the leaves are wet
	28-spotted ladybird beetle (*Epilachna 28-punctata*)	1 Lead arsenate dust 50 per cent, or 2. Lead arsenate spray, 1 lb to 20 gals of water (3 oz to 4 gals)	When pest becomes bad Two applications may be necessary	Both adult beetles and their larvæ attack the plants
	Aphids or plant lice (*Aphis gossypii*)	Nicotine dust, 2½ per cent	Commence dusting as soon as the aphids appear on the plants, repeat at frequent intervals Dust during the warmest part of the day	Cucumbers and melons particularly are susceptible to attack
	Rutherglen bug (*Nysius vinitor*)	1 Pyrethrum dust or 2 Calcium cyanide dust one part lime three parts dust lightly round the roots where the bugs will be found to congregate 3 Plough under all weeds during winter	Treat as soon as the bug commence to migrate from adjacent weeds and grass to the crop	The bug breeds abundantly in weeds Young watermelon vines particularly are susceptible to attack
Bean	Bean fly (*Agromyza phaseoli*)	1 Burn remains of autumn crop 2 Plough all ground during the winter that has been under beans in the autumn 3 Plant small patches of trap crops three weeks before autumn and spring crop plantings commence. Destroy trap plants after they have been through the ground a fortnight 4 Hill round the plants frequently		Only a pest of beans on the coast north of the Hawkesbury River Sprays not effective in control The flies lay their eggs in the trap crops and the larvæ which hatch are then destroyed by burning the plants This prevents fresh adult flies from developing
	Aphids or plant lice (*Aphis rumicis*)	1 Nicotine dust 2½ per cent or 2 Nicotine sulphate spray (1 in 800) plus soap (1½ lb to 50 gals of spray)—equal to 2 tablespoonsful of nicotine sulphate 2 oz soap to 4 gals water	Immediately the aphids appear For broad beans a second or third application will probably be necessary Apply the dust during warmest period of the day	A pest of broad beans particularly
	Bean jassid or leaf hopper (*Empoasca flavescens*)	Treatment as for aphids		
	Bean and pea caterpillar (*Zizina labradus*)	Hand pick and spray or dust patches where caterpillars occur with lead arsenate dust 25 per cent or spray at the rate of 20 oz lead arsenate powder to 40 gals water (2 oz to 4 gals)	Treat patches where caterpillars occur in the crop immediately they appear	Beans with any coating of lead arsenate on them are unsuitable for human consumption

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A VEGETABLE Pest Control Chart—*continued.*

Crop.	Pest.	What to Use.	When to Apply.	Remarks.
Bean—*contd.*	Bean and pea seed weevil (*Bruchidæ*).	1. Fumigate the seed for twenty-four hours with carbon bisulphide at the rate of 5 lb. to 1,000 cubic feet of space. 2. Store seed in closed tin, jar or box.	Examine seed occasionally, and if infested fumigate with carbon bisulphide.	Do not keep infested seed without first fumigating.
	Maize and tomato moth caterpillar (*Heliothis obsoleta*).	1. Arsenate of lead dust, 25 per cent., or 2. Arsenate of lead spray, 20 oz. to 40 gal. water (2 oz. to 4 gals.)	If plants are in bearing pick very heavily before spraying.	Beans with any coating of lead arsenate on them are unsuitable for human consumption.
	The Pseudo-looper (*Phytometra* spp).	Treatment as for maize and tomato caterpillar...	*See* maize and tomato caterpillar	*See* maize and tomato caterpillar. Seldom a serious pest.
	Red spider (*Tetranychus telarius*).	1. Spray with lime-sulphur 1 gal. to 80 gals of water (8 oz. to 4 gals.). 2. Dust with finely powdered sulphur.	Control treatments only required during summer and early autumn.	Do not use lime sulphur stronger than 1 in 80, otherwise a burn may result. Cold or wet weather checks this pest.
Pea	Bean and pea seed weevil (*Bruchidæ*).	*See* under Bean.		
	Maize and tomato moth caterpillar (*Heliothis obsoleta*).	*See* under Bean.		
	Cutworms (*Noctuidæ*)	*See* under Potato.		
	Red-legged earth mites (*Penthaleus* (*Notophallus*) *bicolor*) and (*Holotydæus destructor*).	1. Dust with sulphur. 2. Drench soil at base of plants with lime-sulphur 1 in 80 (8 oz. to 4 gals), or with atomic sulphur, 1 lb. to 16 gals. of water.	Two treatments necessary. ...	Mite hides in the soil if disturbed from the plant. A winter pest in inland areas mainly.
	Snails and slugs (*Helix aspersa* and *Limax* spp.).	1. Arsenate of lead dust, 50 per cent., or 2. Arsenate of lead spray, 20 oz. to 40 gals. (2 oz. to 4 gals.). 3. Poison bran bait (1 lb. calcium arsenate, 1 lb. bran, 2 gals. of water).	Scatter bait broadcast through crop in late afternoon, so that it will remain fresh over-night.	Under damp conditions young crops are sometimes attacked by slugs and snails.
Cabbage and Cauliflower.	Cabbage moth (*Plutella maculipennis*).	1. Lead arsenate dust, 50 per cent., or 2. Arsenate of lead spray, 20 oz to 40 gals., plus calcium caseinate spreader 10 oz. (equal to 2 oz. lead arsenate, 1 oz. calcium caseinate to 4 gals water), and hand dust with equal parts of lime and tobacco dust.	Treat seed-beds two or three times each week. *After* planting out dust every seven or ten days or more according to degree of infestation. Where No. 2 treatment is employed spray every seven to ten days, and dust hearts with lime and tobacco dust once between sprayings.	Dusting with lead arsenate dust is much more effective than spraying. Particular attention should be given to cabbages when the hearts begin to form, but growers should at all times keep a close watch for the presence of grubs.

A VEGETABLE Pest Control Chart—*continued.*

Crop	Pest.	What to Use.	When to Apply	Remarks.
Cabbage and Cauliflower —*continued.*	Cutworms (*Noctuidæ*).	Poison bran bait (1 lb. Paris green, 24 lb. bran, 20 oz. molasses or treacle or 10 oz. salt, 3 gals. water).	When ground is infested before planting, scatter bait broadcast over surface. If plants are already planted out scatter bait through crop	Cutworms shelter in the soil by day and feed at night.
	Brown vegetable weevil or elephant beetle larvæ (*Listroderes obliquus*).	Lead arsenate dust 50 per cent.	When damage is first noticed	Infestation is not common, and only occurs where cabbages or cauliflowers are grown adjacent to weeds such as Cape weed, upon which the larvæ breed readily.
	Aphids or plant lice (*Myzus persicæ* and *Aphis brassicæ*).	1. Nicotine dust, 2½ per cent., or 2. Nicotine sulphate spray (1 in 800) and soap (1½ lb. to 50 gals. of the spray)—equal to 2 tablespoonsful of nicotine sulphate, 2 oz. soap to 4 gals. water	Immediately the aphids are found in numbers on the plants. A severe infestation may require a second or third application. Apply the dust during warmest period of the day.	Watch plants for presence of aphids, particularly in dry weather
	Rutherglen bug (*Nysius vinitor*).	1. Pyrethrum powder, or 2. Calcium cyanide one part, hydrated lime three parts dusted around base of plant, on adjacent weeds dust with calcium cyanide	Apply with dust gun as soon as bugs are found beneath the plants in considerable numbers.	Infestation usually lasts about a month Keep crop well watered
	Thrips (*Thrips* sp.) ...	Nicotine sulphate (1 in 400) plus soap (1½ lb. to 50 gals. of the spray)—equal to 4 table-spoonsful of nicotine sulphate 2 oz. soap to 4 gals water.	Only if infestation is severe	Not a serious pest of cabbages and cauliflowers; control rarely necessary.
	Snails and Slugs (*Helix aspersa* and *Limax* spp.).	1. Poison bran bait (1 lb. calcium arsenate, 16 lb. bran, 2 gals. water) 2. Inferior potatoes or sweet potatoes boiled and sprinkled with white arsenic or dry Paris green 3. Clean cultivation.	Whenever damage occurs scatter bait broadcast through plants or along the rows. Apply bait in late afternoon so that it will remain fresh overnight.	Cauliflowers that are about ready to cut are sometimes damaged in the hearts by slugs.
Turnip ...	Cabbage moth (*Plutella maculipennis*).	1. Lead arsenate dust 25 per cent., or 2. Calcium arsenate dust, 20 per cent., or 3. Lead arsenate spray, 20 oz. to 40 gals. plus calcium caseinate spreader 10 oz., equal to 2 oz. lead arsenate 1 oz. calcium caseinate to 4 gals. water.	When leaves become seriously riddled. Two or more treatments may be necessary	Dusting is more effective than spraying. It is difficult to reach the under-surfaces of leaves with spray
	Brown vegetable weevil or elephant beetle (*Listroderes obliquus*).	1. Lead arsenate dust, 25 per cent. or 2. Calcium arsenate dust, 20 per cent., or 3. Lead arsenate spray, 1 lb. to 16 gals. (4 oz. to 4 gals.) plus calcium caseinate ¼ lb. to 16 gals.	One treatment, as soon as larvæ are found to be causing serious damage, should suffice	Dusting is more effective than spraying on account of better distribution of poison. Damage is chiefly caused by the grubs of the beetle, which occur only during winter.

A Vegetable Pest Control Chart—*continued*

Crop.	Pest	What to Use	When to Apply	Remarks
Turnip—*contd*	Aphids or plant lice (*Myzus persicæ* and *Aphis brassicæ*)	1. Nicotine dust, 2½ per cent, or 2. Nicotine sulphate (1 in 800) plus soap (1¼ lb. to 50 gals. of spray)—equal to 2 tablespoonsful of nicotine sulphate, 2 oz. soap to 4 gals. of water	Immediately the aphids are found in numbers on the plants. A severe infestation may require a second or third application. Apply the dust during warmest period of the day	Dusting is the more effective
	Snails and slugs (*Helix aspera* and *Limax* spp.)	1. Lead arsenate dust, 30 per cent, or 2. Lead arsenate spray, 20 oz. to 40 gals. (2 oz. to 4 gals.) 3. Poison bran bait (1 lb. calcium arsenate, 16 lb. bran, 2 gals. water) 4. Inferior potatoes or sweet potatoes boiled and sprinkled with white arsenic or dry Paris green 5. Clean cultivation	Wherever damage occurs scatter bait broadcast through plant. Apply bait in late afternoon so that it will remain fresh over night	
Radish	Cabbage moth (*Plutella maculipennis*)	1. Lead arsenate dust, 30 per cent, or 2. Calcium arsenate dust, 20 per cent, or 3. Arsenate of lead spray, 20 oz. to 40 gals. (2 oz. to 4 gals.)	Only if pest is noticeably numerous	Treatment rarely necessary
	Brown vegetable weevil or elephant beetle (*Listroderes obliquus*)	See under Carrot and Parsnip		
	Aphids or plant lice (*Myzus persicæ*)	See under Turnip		
	Snails and Slugs	See under Turnip		
Carrot and Parsnip	Brown vegetable weevil or elephant beetle (*Listroderes obliquus*)	1. Lead arsenate dust, 25 per cent, or 2. Calcium arsenate dust, 20 per cent, or 3. Lead arsenate spray, 1 lb. to 16 gals. (4 oz. to 4 gals.)	When the adults occur in the soil beneath plants or when the larvæ occur in the crowns of the plants. One or more applications may be necessary	Larvæ attack plants in winter whilst only the adults occur during the summer
	Aphids or plant lice (*Cavariella* sp.)	1. Nicotine dust, 2½ per cent, or 2. Nicotine sulphate spray (1 in 800) plus soap (1¼ lb. to 50 gals. spray)—equal to 2 tablespoonsful of nicotine sulphate, 2 oz. soap to 4 gals. water)	When the infestation becomes severe make a second application shortly after the first. Apply the dust during warmest period of the day	A moderate infestation is not serious provided that the plants are well watered
Lettuce	Cutworms (*Noctuidæ*)	See under Cabbage and Cauliflower		
	Brown vegetable weevil or elephant beetle larvæ (*Listroderes obliquus*)	Baits of chopped up lettuce or white turnip leaves, or even of Cape-weed, poisoned with lead arsenate and scattered over infested ground several days before planting	Scatter bait in late afternoon so that it will remain fresh over night	Damage is chiefly caused by grubs of the beetle which occur only during winter

A VEGETABLE Pest Control Chart—*continued.*

Crop.	Pest.	What to Use.	When to Apply.	Remarks.
Beetroot, Silver Beet, and Spinach.	Beet web-moth ...	Lead arsenate dust, 25 per cent.	When apparent	Spraying with arsenicals is less effective.
	Brown vegetable weevil or elephant beetle (*Listroderes obliquus*).	1. Arsenate of lead dust, 50 per cent., or 2. Arsenate of lead spray, 1 lb. to 16 gals. of water. 3. Baits of chopped up lettuce or white turnip leaves or even Cape-weed poisoned with the above, scattered over infested ground several days before re-planting.	Scatter the bait in the late afternoon so that it will remain fresh overnight.	The larvæ frequently cause loss among young plants during winter months.
	Aphids or plant lice (*Myzus persicæ*).	1. Nicotine dust, 2½ per cent., or 2. Nicotine sulphate spray (1 in 800) plus soap (1½ lb. to 50 gals. of spray)—equal to 2 tablespoonsful of nicotine sulphate, 2 oz. soap, 4 gals. water.	Only if plants are making no growth and aphids are abundant. If using the dust apply during warmest period of the day.	Treatment rarely necessary.
	Red-legged earth mite (*Penthaleus* (*Notophallus*) *bicolor*) and (*Holotydæus destructor*).	Sulphur dust	When mites become so abundant as to check the growth of the plants.	A winter pest; in inland areas chiefly.
	Snails and Slugs (*Helix aspersa* and *Limax* spp.).	1. Poison bran bait (1 lb. calcium arsenate, 16 lb. bran, 2 gals. of water). 2. Inferior potatoes or sweet potatoes boiled and sprinkled with white arsenic or dry Paris green. 3. Dust round plants with lime and tobacco dust, equal parts.	Apply the bait in the late afternoon, so that it will remain fresh overnight.	....
Rhubarb ...	Brown vegetable weevil or elephant beetle (*Listroderes obliquus*).	1. Lead arsenate dust, 25 per cent., or 2. Calcium arsenate dust, 20 per cent., or 3. Lead arsenate spray, 1 lb. to 40 gals. of water.	Only when damage becomes noticeably severe.	Arsenical sprays less effective. Damage chiefly caused by grubs of the beetle which occur only during winter.
	Aphids or plant lice (*Myzus persicæ*, *Aphis* sp.).	Nicotine dust, 2½ per cent.	Apply when temperatures are high.	....
	Snails and Slugs ...	*See* under Beetroot.		
Onion and Eschalot.	Thrips (*Thrips* sp.) ...	Nicotine sulphate spray (1 in 400) plus soap (1½ lb. to 50 gals. of spray)—equal to 3 tablespoonsful of nicotine sulphate, 2 oz. soap to 4 gals. water.	When greyish mottling occurs on leaves examine for thrips. Treat if numerous.	An early spring following a mild winter favours thrip infestations.

Lettuce Varieties in New South Wales.

N. S. SHIRLOW, B.Sc.Agr., Assistant Plant Breeder, Hawkesbury Agricultural College.

IN a preliminary article (see *Agricultural Gazette* of New South Wales, vol. 40, page 805), varieties of lettuce grown in New South Wales and listed by local seedsmen were classified according to type into three main divisions. These varieties have now been described in full as an aid to growers in identification.

Nomenclature.

Many of the varieties grown are listed under a number of different names. In such cases the name which seems most suitable and least likely to be confused with other varieties has been used.

As far as possible, varieties classed as distinct have been described. In some cases superior or inferior strains of the varieties may be found which vary slightly on different types of soil and in different districts. The varieties are described from observations made at Hawkesbury Agricultural College, Richmond.

Terms Used in Description.

Plant Habit.—The plant may be *spreading, i.e.*, covering more ground than a compact plant (generally the former has more leaves in comparison to head than the latter), or it may be *upright* (like Wonderful), or *flat growing, i.e.*, closer to the ground (like Long Standing).

Solidity refers to the head or centre part of the plant which may be *hard* like a cabbage (as in the case of Iceberg). *Firm* refers more to the Butter types, as the head, although well-formed with leaves tightly overlapping, is not hard on account of the lack of crispness. A *loose head* is one that is easily compressed, having spaces between the leaves. *Open* refers to those varieties which have no dense centre or head (as in Boston Curley—see Fig. 3*).

Size, as it varies considerably under different conditions of growth, is only referred to in the classification where there is a marked difference, as *large* (like Wonderful or Drumhead), *medium* (like Hanson), *small* (like Mignonette).

Leaves.—The leaves vary considerably in shape, form and colour. In the following descriptions the leaves referred to are those just outside the head.

Shape.—Variations occur in shape, and for descriptive purposes the following terms have been used—*Broad* (as in Wonderful, Fig 17*); *spatulate, i.e.*, narrowing down from the top (as in Drumhead), and *narrow* (as in Paris Green Cos, Fig. 15*).

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* The Figure numbers refer to illustrations which will appear in subsequent instalments of this article.

Surface.—The surface of the leaves is described as *blistered* when covered with raised portions, and *crumpled* when these portions are large and cause folds (as in Long Standing, Fig. 11*).

Margins.—The margins of the leaf may be *entire*, *i.e.*, without divisions (as in The Deacon, Fig. 6*); *toothed*, *i.e.*, with sharp serrations (as in Iceberg, Fig. 10*), or *scalloped* (as in Big Boston—see Fig. 2*). In referring to the margin, the upper part is taken into consideration, as the lower part is generally toothed and jagged in all varieties.

Borders.—The border of the leaf may be *frilled*, *i.e.*, more developed than the other parts of the leaf giving a curled appearance (as in Wonderful, Fig. 17* and Grand Rapids, Fig. 8*); *flat* to somewhat blistered (as in most Butter types), and sometimes *undulate*, *i.e.*, more developed than other parts of the leaf, but not enough to be frilled (shown in Big Boston, Fig. 2*).

Colour.—There are numerous shades of colour, but for identification purposes the following only have been used:—Dark, medium, light, dull, bright or yellowish green; reddish coloration—present in varying degrees, or entirely absent.

Seeds.—The seeds of varieties differ in colour and to a certain extent in size and shape. Colour has been used in differentiation as it is the most easily discerned. Seeds may be blackish, *i.e.*, black to dark brown; or whitish, *i.e.*, white to light grey.

Young Plants.—The young plants of varieties differ somewhat, but in most cases the mature plants only have been used in identification. Young plants have narrow leaves and upright growth, as in Cos varieties, or broad leaves and flatter growth as in Butter types. Young plants of the variety Wonderful are notably upright in the centre. In most cases the reddish tinge which characterises many varieties, especially the Butter types, does not appear until the plant approaches maturity.

Varieties Suited to Different Conditions.

Some varieties head well in cool weather, but shoot to seed quickly in hot weather, as in the case of Drumhead and a number of the Butter types. Iceberg forms excellent heads in hot weather, but becomes stunted and the edges of the leaves brown easily with frost. Wonderful produces good heads under both hot and cold conditions.

It has been the experience repeatedly at Hawkesbury Agricultural College in midsummer, when it is difficult to secure a good germination, both in the seed-bed and in the open field, with many varieties of lettuce, especially Wonderful, that seed of the variety Iceberg has been found to germinate excellently. It is not known how to account for this fact beyond an apparently inherent difference, but it may be turned to account by growers in summer sowings. This character is of importance in Iceberg, as it is necessary to have this lettuce full grown before the cold weather.

*** The Figure numbers refer to illustrations which will appear in subsequent instalments of this article.**

Varieties most suited for spring or summer sowing (which form good heads and do not run to seed quickly in hot weather) are Iceberg, Mignonette, Wonderful, Brittle Ice, Long Standing, Continuity, All-the-Year-Round, and May King.

Varieties suited for autumn sowing (which are not affected much by cold and which heart well in late autumn or early winter) are Wonderful, Brittle Ice, Hanson, Cos varieties, and most of the Butter varieties with the exception of May King and All-the-Year-Round.

Tastes of Consumers.

Some people prefer a crisp type of lettuce, such as Wonderful or Iceberg, which produces a good, solid head, whilst others prefer the softer buttery flavour of the Butter Heads or the hard texture of the Cos. A wholly green lettuce is often preferred to one which shows red coloration, although some of the reddish varieties, especially Mignonette, are of very fine flavour.

Maturity.

The varieties have been divided into three divisions, viz., early-, medium- and late maturing, early varieties taking approximately less than seventy days to mature, medium more than seventy and less than eighty, and late more than eighty days from sowing of seed, including transplanting.

The divisions are as follow:—

Early.—Mignonette, Grand Rapids, Tom Thumb, All-the-Year-Round, Boston Curled.

Medium.—Evergood, The Deacon, May King, Continuity, California Cream Butter.

Late.—Hanson, Brittle Ice, Wonderful, Iceberg, Drumhead, Long Standing, Big Boston, Tender and True, Paris Green Cos, Paris White Cos.

Classification.

The varieties may be classified as follows:—

1. CRISP, CURLED TYPE.

(*a*) *Curly- or Crinkly-leaved.*—Mainly large, cabbage heading, late maturing, crisp, with coarse-veined leaves the borders of which are well developed, giving a curly or frilled appearance; this class contains the most important varieties from a commercial standpoint. Wonderful (Fig. 17) and Iceberg (Fig. 10) are examples.

(*b*) *Prickly-leaved Types.*—Characterised by loose leaves which are bunched, but not overlapping tightly so as to form a firm head. The leaves are frilled at the borders and finely toothed at the edges, giving a prickly appearance (as in Boston Curled, Fig. 3, and Grand Rapids, Fig. 8).

2. BUTTER-HEAD TYPES.

Characterised by their buttery flavour and softer texture. The borders of the leaves are flat or undulating, and not frilled and toothed as in the crisp varieties. Long Standing (Fig. 11) shows the type of plant and leaf, and All-the-Year-Round (Fig. 1) shows a section of the Butter type.

3. Cos Types.

Of an upright habit and crisp, with long-shaped head and narrow leaves with coarse hard veins and very large midribs. The Cos lettuce are of two types, viz., self-closing, which form blanched heads without tying up, and open sorts, which will not form blanched heads unless tied. Varieties listed and described belong to the former type. The Cos type is shown by Paris White Cos (Fig. 14) and a section by Paris Green Cos (Fig. 15).

A Colour Classification.

For purposes of identification varieties in the above classes may be placed in groups according to colour as follows:—

Crisp Curled Type.

(*a*) *Curly- or Crinkly-leaved*—

Colour Division 1 (plants green, no part reddish).—Wonderful, Hanson, Drumhead, Brittle Ice.

Colour Division 2 (plants tinged reddish or brownish, large part greenish).—Iceberg.

Colour Division 3 (plants reddish or brownish, small part greenish).—Mignonette.

(*b*) *Prickly-leaved* (plants wholly green).—Grand Rapids, Evergood, Boston Curled, Tender and True.

Butter-head Type.

Colour Division 1 (plants wholly green).—The Deacon, Long Standing, All-the-Year-Round, Tom Thumb.

Colour Division 2 (plants tinged reddish or brownish, large part green).—California Cream Butter, Big Boston, May King.

Colour Division 3 (plants reddish-brown, small part greenish).—Continuity.

Cos Type.

Plants wholly green.—Paris White Cos, Paris Green Cos.

A Key to Varieties.

(A) *Crisp Curled* (*cabbage heading*)—
  (1) Curly- or crinkly-leaved type—
    (*a*) Plants wholly green, no part reddish—
      (i) Leaves twisted, blistered, and finely frilled at borders—
        (*a*) Dark green.—Wonderful.
        (*b*) Light green.—Hanson.
      (ii) Leaves not much blistered and coarsely frilled at borders—
        (*a*) Bright green colour.—Drumhead.
        (*b*) Dull green colour.—Brittle Ice.
    (*b*) Plants tinged brownish or reddish, large part greenish.—Iceberg.
    (*c*) Plants brownish or reddish, small part greenish.—Mignonette.

- (2) Prickly-leaved types (bunching, plants wholly green)—
  - (*a*) Centre leaves sometimes folding in to produce loose heads—
    - (i) Light-green, leaves finely serrated, but not excessively frilled.—Evergood.
    - (ii) Yellowish green, leaves excessively frilled.—Tender and True.
  - (*b*) Never producing heads—
    - (i) Large light green—Grand Rapids.
    - (ii) Small darker green.—Boston Curled.

(B) *Butter-head Types*—

- (1) Plants wholly green—
  - (*a*) Leaves fairly smooth and lightly blistered.—The Deacon.
  - (*b*) Leaves much blistered—
    - (i) Plants medium spreading.—Long Standing.
    - (ii) Plants compact, with small amount of leaves compared to head.—All-the-Year-Round.
    - (iii) Plants very small, compact.—Tom Thumb.
- (2) Plants reddish-brown, small part greenish.—Continuity.
- (3) Plants tinged reddish or brownish, large part greenish—
  - (*a*) Plants compact, with large head compared to leaves.—May King.
  - (*b*) Plants more spreading, with fair proportion of leaves to head—
    - (i) Light dull green, with undulate borders of leaves.—Big Boston.
    - (ii) Medium bright green, with borders of leaf flat to blistered.—California Cream Butter.

(C) *Cos Types (Plants wholly green in colour)*—

- (1) Light green (especially when young).—Paris White Cos.
- (2) Dark green (especially when young).—Paris Green Cos.

Seed Colour Divisions.

The following grouping of seed colours will be found useful in conjunction with the key to varieties, especially in the case of the Bunching and Butter types:—

- (1) *Crisp Curled (cabbage heading) Type*—
  - (*a*) Seeds whitish.—Wonderful, Hanson, Drumhead, Brittle Ice, Iceberg.
  - (*b*) Seeds blackish.—Mignonette.
- (2) *Prickly-leaved or Bunching Type*—
  - (*a*) Seeds whitish.—Evergood, Tender and True.
  - (*b*) Seeds blackish.—Grand Rapids, Boston Curled.

(3) *Butter-head Type*—

(*a*) Seeds whitish.—The Deacon, Big Boston, May King.

(*b*) Seeds blackish.—Long Standing, All-the-Year-Round, Tom Thumb, Continuity, California Cream Butter.

(4) *Cos Type*—

Seeds whitish.—Paris White Cos, Paris Green Cos.

(*To be Continued.*)

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

***Maize*—**	
Fitzroy	Manager, Experiment Farm, Grafton.
Large Goldmine	P. Short and Sons, "Moore Park," Armidale.
Leaming	Manager, Experiment Farm, Grafton.
Murrumbidgee White	M. Leitch, Bulgary Private Bag, Wagga.
***Potatoes*—**	
Factor	C. Barberie, Batlow. R. Quarmby, Batlow. C. Buchele, Box 47, P.O. Batlow.
***Tomatoes*—**	
Bonny Best	Manager, Experiment Farm, Bathurst.
Marglobe	Manager, Experiment Farm, Bathurst.
Sweet Potatoes (cuttings only)—	
Vineless	S. Redgrove, Sandhills, Branxton.
Nancy Hall	
Yellow Strassburg	
Porto Rico	
Brooks' Seedling No. 3	
Director	
Pierson	
Sudan Grass	Manager, Experiment Farm, Bathurst. Manager, Experiment Farm, Nyngan.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

ESTABLISHMENT *of* PASTURES

The young plants during root establishment cannot forage to any extent for plant food. It is therefore essential when seeding a pasture to use a balanced mixture of readily available fertiliser. When the clovers become established, they are able to fix their own nitrogen and require phosphate applications only. The grasses, however, become nitrogen starved during the cold months and show little growth unless supplied with this plant food. Consequently, for the production of a good "soil cover," the exclusion of weeds, and a balance between grasses and clovers, newly sown pastures should be fertilised as follows:—

A—IN AUTUMN AT SEEDING -
2 to 3 cwts. super per acre.
1 to 2 cwts sulphate of ammonia per acre

B—IN JULY—
1 to 1½ cwts. sulphate of ammonia per acre

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The Milch Goat.

CARE AND MANAGEMENT.

S. RUDKIN, N.D.A., Manager, Government Experiment Farm, Nyngan.

RAPID strides have been made in the milch goat industry in New South Wales in recent years, due in no small measure to the lead given by the Department of Agriculture in the establishment of a herd of pure-bred Saanen goats at Nyngan Experiment Farm.

Unfortunately, however, a number of persons who launch out in this industry find themselves for the first time in possession of an animal with the care and management of which they are not familiar, and as literature on goat-keeping under Australian conditions is not available, progress in the industry is seriously retarded, while there is a tendency for interest to slacken. It is with the object of helping the novice goat-keeper to avoid the many mistakes and consequent disappointments that this article has been written.

Cedar Saan Swiss (imp. 504) Herd Sire at Nyngan Experiment Farm.

In the first place, it must be fully realised by the potential goat-keeper that unless he has the inclination and time to devote to the attention of the animal, his efforts with milch goats are doomed to failure. Goat-keeping involves more time, thought, and patience than is generally recognised. Kindness, perseverance, constant attention, and pride of ownership are essential to success.

Confidence between buyer and seller is also necessary; on the one hand, the seller should deliver animals true to description, while on the other, the buyer, particularly with his first goat, should not expect the standard of his doe to be too high, or otherwise he might be disappointed –and once disappointed his interest and keenness disappear. It is much better for one to think he has improved the milking qualities of a doe by careful management, and so gain confidence in himself, than to suspect the seller of substituting an inferior animal. The buyer, of course, has every right to know how his purchase was bred, but it is most noticeable how the beginner in the milch goat industry is apt to over-estimate the milking qualities of an animal he has probably not seen before

Harlidene Major (Imp.—503)—Another Herd Sire at Nyngan Experiment Farm.

One naturally expects his first doe to arrive in the pink of condition and giving signs of making a first-class animal, and when he finds his goat on arrival as hollow as a drum, timid and off its feed, his faith in the milch goat drops to zero; but the animal has probably been a day or more on the journey, probably had no water or food, has received a rough handling since it left home, been poked at by every passer-by, and therefore, being of a highly nervous temperament, is looking at her worst.

Kindness, patience, and attention, however, will soon give the doe confidence, when she will settle down and come back on her feed. In such a case the advantage of keeping a second goat is obvious—goats perhaps more than any animal are fond of company.

Good Shelter and Proper Feeding Essential.

Whether a goat is to be pastured and hand-fed or entirely stall-fed depends on the area available; in either case, it is essential that a suitable shelter be provided for bad weather. Nothing upsets the doe more than wet conditions either above or under foot, while cold winds will quickly reduce the milk flow. In some places it might be advisable to rug in the winter. The floor of the shelter should be raised above the level of the surrounding ground, and the opening should face the north. Concrete floors are not recommended unless plenty of bedding is available, as inflammation of the udder has been traced in some cases to a chill sustained by lying on a concrete floor.

Nyngan-bred Saanen Does.

With a goat known to be bred from a milking strain the secret of success is undoubtedly correct feeding. Mr. H. E. Hughes, a well-known British breeder and leading judge of milch goats, writes us:—"Feeding is the key to success, and unless this is made better known success will be very slow." Our experience fully proves the soundness of his statement.

Unfortunately data on the feeding of goats in Australia is scarce, but we can turn to the Continent and to the United States of America for information that can be relied upon. Considerable experience in those countries gives us reliable information.

The goat is by nature a browser and prefers leaves and twigs to grass, and though looked upon by the man-in-the-street as a scavenger is particular to a degree in choice of food, and when well fed is fond of a change of diet. Again, being a ruminant, a certain proportion of the ration must be made up of bulky food (or roughage). Lack of bulk interferes with the chewing of the cud, and this acts against the laws of nature. It has been noted by stockmen that when this fact has been overlooked by too generous feeding, sickness and in some extreme cases death follows. In drawing up a ration then, provision must be made for bulk, while it is necessary to balance the ration by the addition of concentrates.

Davies gives the amount of succulent food required by a goat to be as follows:—

Maintenance of an idle adult (100 lb. live weight)—¼ to ½ lb. daily.
To improve condition of an idle adult—½ to 1 lb. daily.
Growing kids up to 6 months old—¼ to ½ lb. daily.
Doe in milk—for maintenance—1 lb.; an additional 6 oz. for every pint of milk yielded daily.

Suitable Rations.

The United States Department of Agriculture has proved the following rations satisfactory for milch goats:—

Stall-fed only.—2 lb. lucerne or clover hay, 1½ lb. silage or turnips, 1 to 2 lb. of a grain mixture per head per day. The grain mixture consisted of 100 lb. maize, 100 lb. oats, 50 lb. bran, 10 lb. linseed meal.

On Pastures.—1 to 1½ lb. of the above grain mixture per head per day, but without the linseed meal.

At the New Mexico College of Agriculture the following rations were fed:—

Stall-fed only.—3 lb. of lucerne hay and 1½ lb. grain mixture per head per day.

On Pastures.—1¼ lb. grain mixture daily per head.

The grain mixture was made up of:—4 parts whole oats, 3 parts whole maize, 1 part bran.

A successful New South Wales goat-keeper gives a ration on which he claims to fatten the poorest goat. Though he does not mention the influence of the ration on the milk flow, his does are well known milkers. The animals are almost wholly stall-fed:—

Grain Mixture.—

10 pints bran.
5 pints linseed meal,
5 pints maize meal,
5 pints pea meal,
5 pints wheat and barley meal,
¼ lb. coarse salt, and
¼ lb. bone meal.

1½ to 2 lb. per goat per day.

Roughage.—3 lb. lucerne hay or garden crops.

The Ration Fed at Nyngan Experiment Farm.

At Nyngan Experiment Farm, where the goats have the run of the pastures with an abundance of scrub and grass, the following ration gives good results:—

Whole oats or cracked maize 4 oz., bran 4 oz. per head per day.

Good wheaten hay is also available, and when the feed is dry, part silage is included and a greater percentage of Epsom salts added to the lick.

As individual goats vary in appetite—one may readily eat a ration that another may not like so well—each doe should be watched at feeding time. It should be remembered that a heavy milker requires heavy feeding. It is usual to feed part of the grain mixture at milkings, having the roughage handy at all times, care being taken to see that the latter is cleaned up and not trodden underfoot.

A kerosene case with a V shape cut out of one side and nailed up 2 feet from the floor will be found a suitable manger.

Among the feeds available in New South Wales may be mentioned:—

Bulk or Roughage.—Shrubs, grass, hay, silage, chaff, vegetables (such as cabbage, turnips, swedes, rape, artichokes, &c.), kitchen scraps, lucerne, maize tops, banana leaves, &c.

Concentrates.—Oats, maize, barley, rice, peas, beans, dried brewers' grains, bran, pollard, linseed meal, cotton seed meal, pea meal, peanut meal, wheat meal, barley meal, and linseed and cotton cakes.

From these no difficulty should be experienced in making up a ration by any goat-keeper, but it should be kept in mind that home-grown produce lessens the cost and that green feed of all kinds is an excellent milk producer.

Water and Lick.

A plentiful supply of good water should be on hand at all times. From 85 to 90 per cent. of blood and milk produced by a goat is in the form of water. The amount taken by a goat varies greatly, consequently plenty should be available, while it is most important that it be clean.

Experience with stock in New South Wales has shown that for an animal to thrive and remain in the best of health salt lick in some form or other is necessary. For a stall-fed goat the following lick is suggested:—Coarse salt, with 6 per cent. Epsom salts and 15 per cent. bonemeal added. Where running on pastures or receiving green feed the Epsom salts can be omitted. Bonemeal is necessary on most soils; where it is found that goats do not take to the meal in the lick, a little may be added to the grain mixture.

Milking.

The udder of a goat is a most delicate organ, and the goat-keeper must watch and give it every attention from the time the doe begins to spring until she is dried off for her next kidding. Carelessness in milking produces a badly shaped udder, while imperfect milking will result in a decreased quantity of milk. Other things being equal, the more frequent the milkings the higher the yield, but it will be found that two milkings in twenty-four hours are sufficient in most cases. Heavy producers require three milkings. Cleanliness of the udder and milking utensils is necessary to obtain milk that will keep. Clean goat's milk possesses no odour or flavour.

Kidding.

The gestation period of a doe is usually twenty-one weeks. At the end of this period the doe should be closely watched, as it is possible that after a railway journey a malpresentation may occur. Should this happen assistance must be given immediately. Goats appear to be sensitive in this direction. Should the afterbirth not be got rid of within reasonable time, septicaemia is liable to set in the doe becomes listless, repeated straining occurs and the animal goes off her feed and lies down Where this happens she should immediately be washed out with warm water containing 5 per cent. lysol or other approved disinfectant, and a dose of Epsom salts given (two tablespoonfuls in a pint of warm water).

Nyngan Nada (159), Showing Udder Development.

The kid should run with the doe for the first two or three days, after which, if it is not a nanny and required for breeding purposes, it is just as well to destroy it. Kids are expensive to rear where milk is required for the household, while a doe will last a number of years for milking if properly looked after and mated correctly.

It has also been found that the lactation period can be extended when kids are out of the way.

Milk Yields.

One repeatedly hears the question: "How much milk can a doe be expected to give?" Davies mentions that a goat should give in twelve months six times her own weight in milk.

Length of lactation period is the main consideration to which the attention of goat-keepers is directed, and extension of this period by correct feeding and attention to breeding is one direction in which we can improve the milch goat in New South Wales.

Breeders of milch goats are alive to the value of herd-testing and milk recording. This work has made rapid progress during the past few years in England and the United States of America. The world's record milk production, namely, 5,050 lb. 15 oz. of milk in 365 days, is held by the British goat, Champion Springfield Precocity Q*Q*. Precocity gave an average daily yield of 13 lb. 13 oz., her highest day's yield being 16 lb. 7 oz. Kidding on 14th August, 1929, she was still giving 13 lb. milk per day on 1st October, 1930 a truly wonderful performance.

The highest daily record is held by Champion Whimsical of Westons Q*Q*. This animal yielded 21 lb 6 oz. milk in the day.

Nyngan Pearl (154).

Note the udder development This animal produced 1342 lb milk in 184 days (third kidding).

The Buck Used.

The buck is half the herd, and as such should receive the attention he deserves. He should be a pure-bred animal of the best milking strain procurable, and should be correctly fed in order to obtain strong, healthy kids.

Best results and more kids are obtained where the buck is kept separate from the does.

Worms and Lice.

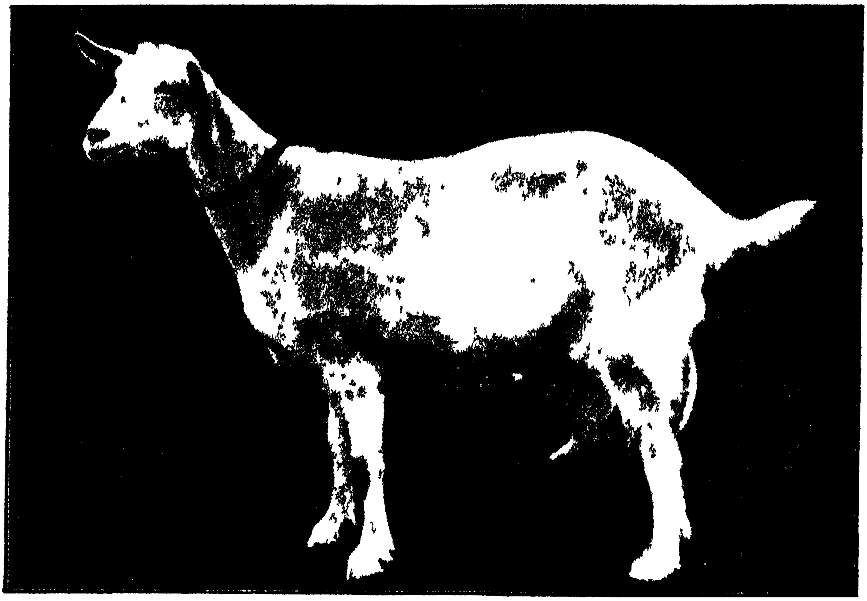
Worms.—Trouble with stomach worms in goats occurs in certain districts in New South Wales where the animals run on pastures that are worm-infested.

The following drench is recommended:—Bluestone, 1 oz.; mustard, 1 oz.; water, 3 pints Dissolve 1 oz. of powdered copper suphate (bluestone) in a pint of hot water, using an enamel or earthenware dish. When thoroughly dissolved add 1 oz. of mustard; then add cold water to make up to 3 pints.

The dose for an adult goat is 2 oz., and for a goat under twelve months, 1½ oz. Give two doses with an interval of fourteen days between.

Lice.—Lice are likely to appear where goats are not thriving. Constant grooming of the goat and cleanliness in the shelter are preventives, but when present a thorough washing with a reliable sheep dip, repeated in five days' interval, will get rid of them.

If carried out in the cool weather it will be necessary to use lukewarm water and to select a warm, sunny day, otherwise the goat is liable to contract a chill.



Champion Springfield Precocity Q*Q*.

[*From British Goat Society's Journal*

Literature on Goat-keeping.

The following books on goats can be recommended:—

"Goat-keeping for Milk Production," by C. J. Davies (London), 13s. 6d.

"The Book of the Goat," by H. S. Holmes Pegler (London), 8s.

"Goat-keeping for Amateurs," by H. S. Holmes Pegler (London), 1s. 6d.

"Year Book of the British Goat Society (London), 1s. 6d.

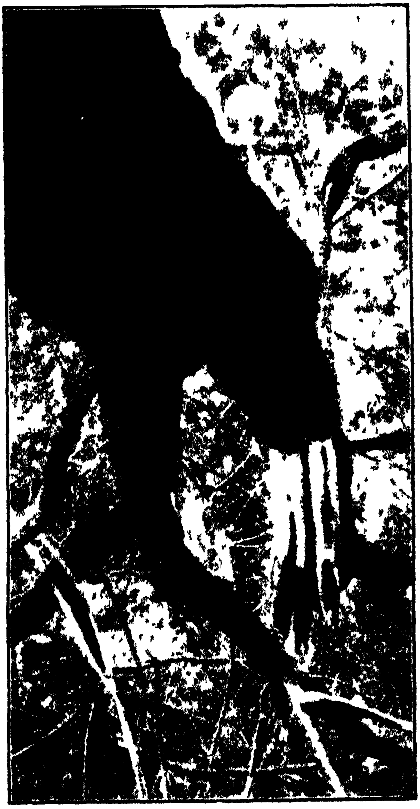
Monthly Journal of the British Goat Society (10 Lloyd's-avenue, London, E.C. 3), price 6d.

Bees Accept the Open Air Life.

W. A. GOODACRE, Senior Apiary Instructor.

WHEN, as the result of natural increase, bush bees swarm they seek a hollow in a tree or log in which to live, but at times quite unusual places, such as between walls of houses, in rock caves, etc., are accepted, and on rare occasions, such as is here related, the bees are forced to accept the open air life.

The accompanying illustration shows the home established by a colony under the limb of a fallen oak tree in a sheltered spot in the Bago Forest, Wauchope. The fact that the timber in the forest offered ample convenience for a more comfortable home opens up an interesting line of thought as to why the bees established a home in the open. The past season—and judging from the appearance of the combs, work was commenced then—was noted for its unusual rainfall, and no doubt the swarm after its issue from the parent colony clustered under the oak limb in preparation for further flight. But, because of unfavourable, damp conditions over a lengthy period the bees were unable to proceed, and as a last resource, and perhaps taking the view, too, that some protection was offering where they had clustered, they decided to commence home building work. Fine weather later allowed good progress to be made.



Bees Build Home in the Open.

The colony was subjected to something like 50 ins. of rain during the autumn and winter of 1930, yet from the protection given overhead by the limb, and by the ingenious work of the bee architects in joining up the sides of some of the combs and securing others by brace work for strength, the bees were enabled to live through the trying winter period and the colony came into spring with a population sufficient to carry on. The illustration was secured during August, and the bees were then clustered on the inside combs (where the most comfort was available) to allow of the brood rearing which was being carried on.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tubercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
Department of Education, Gosford Farm Homes	30	3 Aug., 1931
A. Shaw, Barrington (Milking Shorthorns)	122	9 ,, 1931
E. P. Perry, Nundorah, Parkville (Guernseys)	22	13 ,, 1931
Wagga Experiment Farm (Jerseys)	55	14 ,, 1931
J. F. Dowe, "Woolomol," Tamworth	59	19 ,, 1931
Sacred Heart Convent, Bowral	12	20 ,, 1931
St. Patrick's College, Goulburn	8	22 ,, 1931
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	46	22 ,, 1931
A. L. Logue, Thornbro, Muswellbrook	40	23 ,, 1931
Gladesville Mental Hospital	42	25 ,, 1931
A. H. Webb, Quarry-road, Ryde	6	26 ,, 1931
James McCormack, Tumut	111	29 ,, 1931
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	81	12 Sept., 1931
S. L. Wills, Greendale Dairy, Cowra	37	19 ,, 1931
Wolaroi College, Orange	10	4 Oct., 1931
Riverstone Meat Co., Riverstone Meat Works, Riverstone	104	11 ,, 1931
E. S. Cameron, Big Plain, Narrandera	28	14 ,, 1931
J. L. W. Barton, Wallerawang	17	17 ,, 1931
Newington State Hospital and Home	108	24 ,, 1931
J. F. Chaffey, Glen Innes (Ayrshires)	75	4 Nov., 1931
Lunacy Department, Callan Park Mental Hospital	29	13 ,, 1931
J. Davies, Puen Buen, Scone (Jerseys)	85	14 ,, 1931
Wollongbar Experiment Farm, Lismore (Guernseys)	129	21 ,, 1931
Tamworth District Hospital	7	24 ,, 1931
Department of Education, Brush Farm, Eastwood	6	9 Dec., 1931
Bathurst Experiment Farm (Jerseys)	21	16 ,, 1931
H. A. Corderoy, Wyuna Park, Comboyne (Guernseys)	59	8 Jan., 1932
New England Girls' Grammar School, Armidale	29	10 ,, 1932
C. J. Parbery, Allawah, Bega	119	10 ,, 1932
New England Experiment Farm, Glen Innes (Ayrshires)	37	12 ,, 1932
W. Spindler, Mt. Pleasant, Bega	66	15 ,, 1932
W. T. Herbert, Racecourse Farm, Bega	68	18 ,, 1932
R. C. Dickson, Elwaton, Castle Hill (Jerseys)	17	20 ,, 1932
Lunacy Department, Morisset Mental Hospital	22	23 ,, 1932
Lidcombe State Hospital and Home	146	11 Feb., 1932
Riverina Welfare Farm, Yanco	77	25 ,, 1932
Department of Education, Yanco Agricultural High School	33	26 ,, 1932
W. M. McLean, Five Islands Road, Unanderra	78	27 ,, 1932
Mittagong Farm Homes	46	3 Mar., 1932
George Rose, Aylmerton	4	4 ,, 1932
Kinross Bros., Minnamurra, Inverell (Guernseys)	66	5 ,, 1932
P. M. Burtenshaw, Killean, Inverell	50	5 ,, 1932
Miss Brennan, Arankamp, Bowral	10	6 ,, 1932
Kyong School, Moss Vale	4	12 ,, 1932
G. A. Parish, Jerseyland, Berry	123	13 ,, 1932
Lunacy Department, Parramatta Mental Hospital	33	16 ,, 1932
Cowra Experiment Farm	32	24 ,, 1932
Hawkesbury Agricultural College (Jerseys)	115	25 ,, 1932
Russell Lamrock, Orange	4	26 ,, 1932
St. Joseph's Convent, Reynold-street, Goulburn	3	26 ,, 1932
St. John's Boys Orphanage, Goulburn	0	26 ,, 1932
Marion Hill Convent of Mercy, Goulburn	9	20 ,, 1932
Lunacy Department, Kenmore Mental Hospital	79	27 ,, 1932
St. Joseph's Girls Orphanage, Kenmore	9	27 ,, 1932
J. P. McQuillan, Bethungra Hotel, Bethungra	14	1 April, 1932
St. Michael's Novitiate, Goulburn	5	26 ,, 1932
James Wilkins, Jerseyville, Muswellbrook	89	28 ,, 1932
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	205	29 ,, 1932
Tudor House School, Moss Vale	8	3 May, 1932
Australian Missionary College, Cooranbong	53	6 ,, 1932
Navua Ltd., Grose Wold, via Richmond (Jerseys)	16	13 ,, 1932
E. C. Nicholson, Jillamatong, Corowa	134	2 June, 1932
Grafton Experiment Farm (Ayrshires)	194	4 ,, 1932
P. Ubrihien Corridgeree, Bega	133	8 July 1932
William Thompson Masonic School, Baulkham Hills	45	16 ,, 1932

—MAX HENRY, Chief Veterinary Surgeon.

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G. D. ROSS, Under Secretary,
Department of Agriculture,
SYDNEY.

Black Spot or Scab of Apple.

EXPERIMENTS FOR ITS CONTROL IN NEW SOUTH WALES.

Part I.—Distribution, Life-history, etc.

W A. BIRMINGHAM, Assistant Biologist.

BLACK SPOT or scab is perhaps the commonest and most destructive fungous disease of the apple in New South Wales. It is caused by the fungus *Venturia inaequalis* (Cke.) Aderhold, the conidial or summer form of which is *Fusicladium dendriticum* Fel.

History and Distribution.

It occurs in Europe, North America, South Africa, New Zealand, and all the States of Australia

According to Carne (1) it was unknown in Western Australia in 1924. McAlpine (2) stated in 1902: "It has made its appearance in all the Australian States, and seems to thrive well where the climate is neither too hot nor too dry." There appears to be some doubt in the minds of officers of the Western Australian Department of Agriculture about McAlpine's record. Pittman (3) stated in 1930: "On 4th April of this year a small number of Cleopatra apples badly affected with *Venturia inaequalis* were brought to this office . . . from Manjimup, this constituting the first

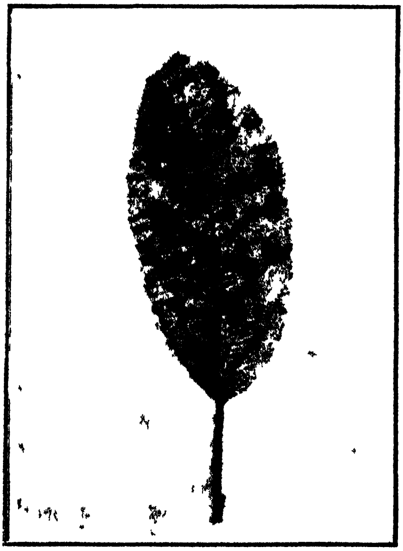

Fig. 1.—Black Spot Lesions on the Upper Surface of Apple Leaf.

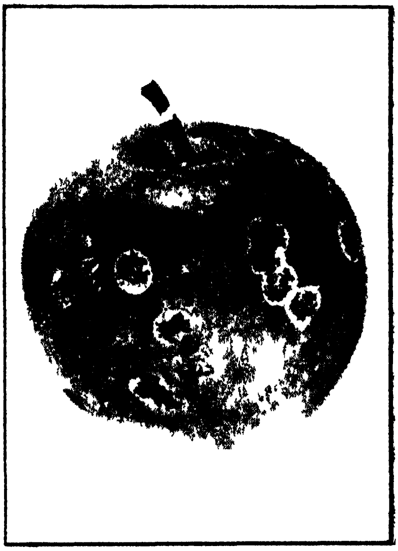

Fig. 2.—Black Spot Lesions on a Granny Smith Apple.

unquestionable record of the disease in Western Australia . . . several smaller lesions being also found on a few Granny Smith fruits and numerous, newly-formed lesions on the leaves of a large number of trees of various varieties in the vicinity of the badly affected zones. . . . On 29th April a number of Granny Smith apples from an orchard at Porongurups, about 100 miles away, were also received at this office and found to be affected with the Fusicladium stage of the scab fungus."

The earliest record of the disease in New South Wales which the author has been able to trace is 1891 (4), in which year an article by Cobb states: "A number of diseased apples forwarded to the Department . . . were ascertained to be affected by the attack of a fungus known as 'Apple Scab,' a disease of unfortunately too frequent occurrence." The latter part of this statement suggests that black spot was at that time a common disease and probably had been present in this State for a considerable time. Black spot of apple has since been found in the following subdivisions of New South Wales:—South-western Slopes, Central Tableland, Southern Tableland, South Coast, and the metropolitan area.

Economic Importance of the Disease.

Heald (5) states that in the United States of America the annual loss runs into millions of dollars. In the State of Montana in U.S.A. in the years 1911 and 1912 the disease caused a loss of 15 per cent. of the crop.

Referring to New Zealand conditions, Cunningham (6) states: "Black spot is the most serious apple disease with which the orchardist has to contend. . . . In cases of severe infection the crop may become a total loss."

Basing their remarks on the results of experiments at Batlow, New South Wales, details of which will appear in Part II of this article, some Batlow growers have expressed themselves in the following terms:—

Grower A.—"(1) The result of the experiments has demonstrated that black spot can be controlled.

"(2) If all growers would adopt control measures based on the results of this experiment it would save in an average year 75 per cent. of the Granny Smith crop alone. This crop was worth approximately £10,500 this season (1930) for this district. Rome Beauty, London Pippin, and Delicious are all very susceptible to black spot in this district, and it would mean a further saving of at least 75 per cent. in these crops. These varieties are almost valueless if infected with black spot, and as they are largely grown control would mean the saving of many thousands of pounds.

"(3) The work in connection with these experiments has settled the question in the minds of a large proportion of the growers, and they have adopted, almost universally, the formula used in Plot 2. In many instances it has been a considerable saving to our growers.

"(4) The fact that black spot makes the fruit almost unsaleable is sufficient reason to class it as a very serious disease, and, as our district lends itself to the favourable growth of black spot, it affects us vitally unless we adopt a most efficient spray programme, and the adoption of the formula used in this experiment has relieved our anxiety. I personally last season adopted the formula of Plot 2, and have not had one black spot in 7,000 cases of apples, which is sufficient proof of the value of the experiment. We appreciate and are thankful for the effort of the Department."

Grower B.—"Assuming 10 per cent. loss annually over the whole State, with an average crop of one million cases at five shillings per case this would amount to £25,000.

"I think that black spot is a serious disease, which can only be controlled by adopting an efficient spray programme, based on the result of the experiment carried out at Batlow."

Grower C.—"In our district the effective control of black spot would mean £5,000 in growers' pockets over returns from fruit if no control were exercised. There are many districts similarly situated to our own in respect of climate and humidity where the same results would hold.

"There is no question in my mind that the work done here by the Department in this matter has been of great value and merit. It has done much to alleviate the damage to our fruit by this disease. At the same time it does appeal to me that each district should have some local organisation to direct and stress attention of growers on the work done for them, if such work is to bear the fruit which the painstaking work of the officers of the Department deserves.

"I have no doubt as to the serious nature of black spot, and am satisfied that it can only be controlled by an efficient spray programme, both as to the time and material used, based on the results of the five year experiments carried out by the Department at Batlow."

Grower D.—"The degree of control effected over the full term of five years amply demonstrates the effectiveness of some of the combinations used, and fairly conclusively proves that black spot can be satisfactorily controlled. . . . Taking 100,000 cases as a unit, one might say that, with ordinary luck under the old methods of spraying, a 30 per cent. infection might be somewhere near the average result, so that some 30,000 cases would be more or less disfigured and passed into lower grades. On the other hand, and allowing some latitude for carelessness over larger areas, the formulas arrived at should give a result somewhere round about a 5 per cent. infection,* or 5,000 cases of infected fruit as against the other 30,000 cases—a difference of 25,000 cases added to top grade. Allowing that two shillings per case is saved on the 25,000 cases, the result would be a saving to growers on each 100,000 cases of £2,500.

"I think the value of the work in connection with these experiments can hardly be overstated. Black spot takes probably larger toll than any other pest or disease in this district. The results obtained by the Batlow experiments lead me to suppose that for Batlow at any rate the programmes demonstrated as the best in the tests should form the basis of black spot control measures. . . . I favour the No. 2 formula."

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* The average percentage of infection over a five-year period in Plot 2 was 1·4.

Mr. E. C. Whittaker, Orchard Inspector, Batlow, states: ". . . In this district, where black spot is a serious menace, it is safe to say that if it were uncontrolled, or the old haphazard methods of control followed, at least 10 to 20 per cent. of the crop would be either unsaleable or damaged to such an extent as greatly to decrease its value. This would mean a loss to the district of somewhere in the vicinity of seven or eight thousand pounds annually, and whilst other districts do not suffer to the same extent . . . I think one would be safe in assuming a loss over the whole of the State of from £20,000 to £25,000 each year."

In August, 1930, Inspector Whittaker reported: "Following on the result of the departmental experiment for the control of black spot at Batlow, the use of Bordeaux mixture as a 'spur-burst' spray, followed by lime-sulphur (see Table 2, Plot 2)* is becoming the standard practice throughout the district for the control of this most troublesome disease."

Symptoms of the Disease.

The first parts subject to attack are the leaves of the blossom buds—the parts first exposed—and as they are followed by flowers and then by the leaves from the leaf buds the infection extends. The flower stalks when attacked show black patches on the surface These patches extend, and soon the flowers and stalks blacken, shrivel, and die.

The leaves may be affected on both surfaces. On the lower surface the diseased area usually appears as a discoloration slightly darker than the normal green of the leaf. The colour deepens with age until black, and the spot is more or less velvety. There is sometimes a tendency for the spots to extend along the veins and to spread irregularly into the healthy tissue. On the upper surface (Fig. 1) the spot appears first as a lighter green than the healthy tissue, later becoming dark and somewhat velvety The spots may be few and scattered, or so numerous as to coalesce, covering almost the whole surface. The diseased areas may be distinctly bordered, or they may spread out indefinitely into the healthy tissue. Infected leaves may become incurved, distorted, or blistered.

On the fruit (Fig. 2) dark-coloured spots appear, small at first, and often sharply bordered. As these grow, the central and older part becomes brown and corky, while the margin is black. A more or less whitish band, due to the loosened cuticle, may surround the black margin. The thick corky tissue that develops may begin to crack, and in bad cases the fruit becomes fissured and distorted, and the surface roughened and scabby.

The twigs are less commonly attacked. They have a scurfy appearance, the bark becoming blistered and ruptured in places.

Fruit infection may result in a loss caused in five ways:—(1) The fruits may fail to set owing to the blossoms being killed by the fungus; (2) young fruits may be shed; (3) fruits may become distorted, badly scabbed or cracked, rendering them unsaleable; (4) the quality and keeping properties may be reduced; (5) fruits which show no indication of infection when harvested may develop the disease in storage.

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* This will appear in Part II of this article.

Life-history of the Fungus.

There are two stages in the life-history of the fungus: the conidial (Fig. 3) or summer form, known as *Fusicladium dendriticum*, which is conspicuous on the leaves and fruit, and the ascigerous, or winter stage (Fig. 4), which develops in the fallen leaves at the end of the season. Both of these stages occur in this State. The latter form prolongs the life of the fungus through unfavourable winter conditions and acts as a source for the renewal of the conidial stage in spring. The mature or ascigerous stage was first recorded for New South Wales in 1920, by Hamblin (7), on apple leaves from Towrang, in the Goulburn district.

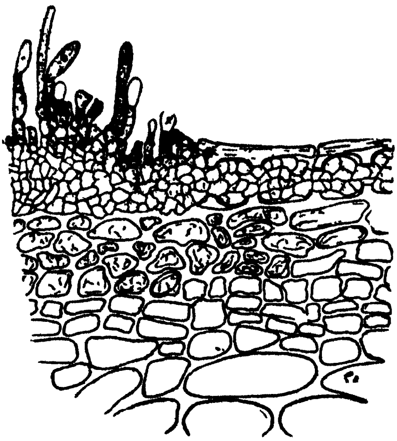

Fig. 3.—Section of Apple Leaf showing Elliptical-shaped Spores of the Summer Stage at the Top.

[After Cunningham.

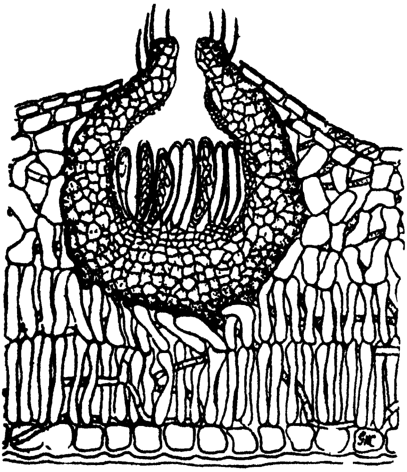

Fig. 4.—Section of Leaf showing a Perithecium with Spore-sacs and Spores Imbedded in the Tissues (Winter Stage).

[After Cunningham.

The fungus may also over-winter in the mycelial condition on infected shoots. In spring the summer spore stage is developed on these shoots, causing infection on the leaves and fruit. Given suitable conditions, the fungus in the fallen leaves gives rise about October to spores (ascospores) which will produce infection in the unfolding flowers and leaves. The period of liability to infection covers about a month or more.

An abundant supply of moisture is essential for the discharge of the spores (ascospores) from the fallen leaves and also (upon the developing flowers and leaves) to enable the spores to germinate and gain entry into the tissue of these parts. When the ascospores (winter stage) are discharged from receptacles (perithecia) in the fallen leaves they are carried by air-currents to adjacent developing flowers, leaves, and fruit. In the presence of moisture the spore sends out an infection thread which pierces the outermost skin (cuticle) of the part attacked and enters the underlying tissues, where it forms a branched mass of threads (mycelium). These threads (hyphae) derive their nourishment from the solution of the cuticle and from the tissue beneath.

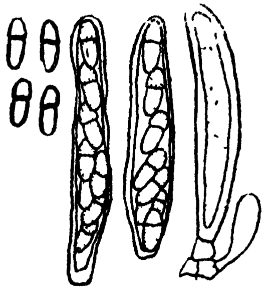

Fig. 5.—Free Spore-sacs and Spores (Winter Stage). [*After Cunningham.*

The compact mass of threads (stroma) which is formed gives rise to the conidial or summer stage, which can be propagated rapidly, infecting fresh leaves and fruit. Warm, moist weather in spring favours an outbreak on the flowers and developing leaves and fruits.

The weather, the topography of the land, and other general environmental conditions govern to a great extent the severity of infections.

Black spot of apple is unable to infect the pear, this disease of the pear being caused by a closely related, but distinct, species of fungus.

Spray Programme for Black Spot.

The following spray programme is recommended for the control of black spot of apple in New South Wales.—

Bordeaux mixture (6-4-40) at the spur-burst stage.
Lime-sulphur (1-14, 26 deg. B.) at the pink stage.
Lime-sulphur (1-35, 26 deg. B.) at the calyx stage.

Full details of experiments conducted in the Batlow and Penrose districts will be published in subsequent issues of this *Gazette*.

The original photographs reproduced in this article are by Mr. P. R. Maguire, Biological Branch, Department of Agriculture.

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(To be continued.)

The Taint Problem in Relation to the Export of Citrus Fruits.

C. G. SAVAGE, R.D.A., Director of Fruit Culture.

WHILE no difficulty has been experienced in obtaining shipping space for the export of citrus fruits to the near East and to Canadian markets, some shipping companies trading with the United Kingdom refuse to carry citrus because of the danger of certain cargo, such as butter, cheese, eggs, tea, flour and meat, becoming tainted with the odours given off by the fruit.

To obtain the fullest information on the subject the New South Wales Fruit Marketing Committee communicated with a number of institutions interested in the citrus export trade, and the following extracts have been culled from the replies received.

The Solution—Separate Air-tight Holds.

The Commonwealth Council for Scientific and Industrial Research pointed out that, in their opinion, the problem was not one calling so much for research as in the making of arrangements whereby the holds containing cargo that is likely to become tainted can be shut off entirely from the holds containing citrus fruits. In their reply they say:

> The citrus fruits, and for that matter many other varieties of fruits and foods that are usually stored under cold conditions, slowly give off characteristic odours, and these, in the confined spaces of the store or hold, soon become somewhat concentrated. Accordingly when citrus fruit is stored in close proximity to other food, for example in the same hold, it naturally taints such food. Taint is also caused if the air that has circulated through the stored citrus fruit is allowed to come into contact subsequently with other foods.
>
> As you are aware many ships fitted with refrigerated holds use a system of refrigeration which depends on the circulation of cold air from hold to hold. In such ships it is impossible to prevent food contained in one hold being tainted if citrus fruit is stored in a hold alongside. Some ships, on the other hand, are fitted with the grid system, in which the refrigerating effect is brought about with metallic grids situated in the sides or in the roofs of the holds and carrying cold brine. These holds can, of course, be shut off from the atmosphere, and the tainting of holds alongside can thus be easily avoided.
>
> An obvious way of overcoming citrus taint is thus to prevent air that has been in contact with citrus fruit from coming into contact with other foods. To do that in the export of citrus abroad it is presumably necessary to ship the fruit in the one hold, which must then be provided either with the grid system or with some air circulation system in which it is not necessary to circulate air into any other hold. Presumably there is no other way of overcoming the difficulty, and therefore it is not so much research that is needed as the making of arrangements whereby holds in which the above conditions apply should be made available to the exporters of citrus fruits.
>
> Adverting to your remarks regarding the fact that no embargo has been placed by shipping companies on the export of citrus fruit from such countries as California, South Africa and Brazil, presumably this is so because such countries export citrus fruit in large quantities and so are able completely to fill several holds on the one ship, thus enabling the ship's engineers to arrange for no other food being brought into the same air circuit. Consequently no trouble by taint arises. Further, there seems no reason to doubt that were Australia able to export citrus fruit in such quantities as to fill holds completely, there would be no embargo by shipping companies operating in Australian waters.

Of course, we realise that as regards the shipment of large quantities of citrus fruit Australia is handicapped in comparison with other countries by reason of the long distances the fruit would need to be carried to the consuming centres. Fundamentally this handicap arises because at the present time the export of Australian citrus fruit is uncertain, and particular shipments cannot be sent with nearly so much certainty that they will arrive in good condition as can, say, shipments of apples.

For some time past this council, in co operation with various other bodies, including the Victorian Central Citrus Association, has been investigating the storage of citrus fruits in land stores with the ultimate object of obtaining information on which to base a method of procedure whereby citrus fruit can be cold stored for long periods without any appreciable loss. Once such a procedure has been fully demonstrated it would of course then be possible to export the material from Australia in large quantities with perfect safety, and once that position was reached the whole question of taint and embargoes would automatically disappear.

In a subsequent communication from the Council for Scientific and Industrial Research they say:

We have discussed the matter with Associate-Professor W. J. Young, our adviser on cold storage problems, and he has pointed out that citrus taint may possibly be caused in ships by the bellows action of the holds. This action has been discussed, so far as apples are concerned, by Mr. A. J. Smith in his reports on "brown heart" disease. It could, of course, be overcome provided that bulkheads separating the holds were made perfectly gas tight. He points out too that apples give off a considerable odour which is quite characteristic and which is very objectionable in other food products. However, shippers raise no question whatsoever as to apple taint, and this seems to be due to the fact that shippers of apples are able to supply full holds.

The Position as Seen by the New South Wales Association.

The view taken by the New South Wales Central Citrus Association (not now in operation) was as follows:—

The position, as we know it, is that the shipping companies, generally, object to carrying citrus because—

(1) It may taint other goods carried on the same voyage.
(2) It may contaminate the hold insulation, so that on later voyages other cargoes would be affected.

We believe that some means can be found whereby both the immediate and the future contamination can be avoided, either—

(*a*) By proper ventilation of the holds.
(*b*) By the discharge of the hold gases outside of the vessel.
(*c*) By ozonisation, which is very effective in deodorising.

With regard to (*a*) and (*b*), we have found with experiments in cold storage here that by properly discharging the air of a room containing thousands of rotting oranges, we have been able to maintain an atmosphere in the room quite sweet, without in any way injuring the fruit.

In respect to (*c*), this is a very promising field of improvement, involving practically no expense, and is in use, we are informed, in connection with perishable products, including fruit, to Europe and America.

The Problem in Other Countries.

Other citrus-exporting countries were communicated with in regard to the problem, and the replies from South Africa and California are given below:—

FROM THE SOUTH AFRICAN DEPARTMENT OF AGRICULTURE.

The question of citrus taint in ships and cold stores is a matter of considerable anxiety to this Department, especially where eggs are carried in the same hold at a later date. We may state, however, that so far as ships are concerned no incidence of tainting has occurred.

The insulations on the older ships are constructed with varnished wood over granulated cork, and each voyage they are washed as far as possible and fumigated with formalin tablets burnt in the hold.

The new shipping accommodation is designed especially to avoid any risk. All the insulation is faced with sheet zinc held down with butt straps over every joint. The floors are of asphalt composition, and air trunks, &c., are of galvanised iron.

As already stated this Department has had no experience in tainting difficulties, but the immunity may be due to the fact that practically all citrus fruit is precooled before loading into the ship.

FROM CALIFORNIA DEPARTMENT OF AGRICULTURE.

We regret to advise that we have no information on the subject, having had no complaints of injury of this kind.

While it is generally assumed that oranges will affect other products, we have never been called upon to investigate any trouble of this nature.

Some Shipping Companies will Carry Fruit.

The following replies indicate the attitudes of shipping companies to the carrying of citrus:—

Oversea Transport Association.—Unquestionably, there are shipping companies which decline to carry citrus fruit, because of unfortunate and expensive experiences with taint, or because cargo already booked, such as flour, does not permit of effective prevention of taint. But our association is not aware of any concerted action by shipping lines, nor does our inquiry to-day bear out this claim.

We are informed that several shipping lines are prepared to carry citrus fruit, provided sufficient notice is given to enable the necessary stowage accommodation to be reserved, and provided the quantity offered is sufficient to fill the specified compartments

P. and O. Steam Navigation Co.—A reply was received to the effect that, providing shippers of oranges could guarantee a minimum of 10,000 cases for any one vessel, that office would be prepared to consider cabling their London principals regarding the acceptance of the shipment. Definite information could not be furnished, as the ability to take oranges depended to a great extent on the shipping situation during the period that orange shipments are likely to be available. It was certain, however, that space could not be provided for citrus fruits from September to May inclusive. In reply to an inquiry as to whether refrigerating installation on vessels of the line could be adapted to the conditions suggested by the Council for Scientific and Industrial Research for overcoming citrus taint, the company advised that there were no adjacent holds on the vessel which could safely be adapted to such conditions.

Aberdeen and Commonwealth Line advised that the matter had been referred to the London office because that office had issued definite instructions that oranges were not to be carried in vessels of the line under any consideration.

Dalgety & Co. (agents for White Star and Aberdeen Line) stated that after going into the question they regretted that at the moment no prospect of being able to carry oranges next season could be seen. The matter, however, would be considered at a later stage if representations were made to shippers in regard to actual consignments available.

Orient Line advised that the small chambers of their vessels could not be used for citrus fruits when other cargo likely to be tainted was carried in adjacent spaces. On any occasion when space was required for citrus fruit the matter would be considered with a view to ascertaining whether suitable arrangements could be made.

John Sanderson & Co. (Blue Funnel and P. and O. Branch Service) anticipated very little difficulty in arranging for the carriage of citrus fruit, providing that the whole of a chamber could be filled or approximately filled. Subsequently this statement in regard to the P. and O. Branch line was qualified to the extent that if freight such as flour, meat, butter, eggs or tea had been booked, citrus fruit could not be accepted.

Queensland Companies.—The Director of Fruit Culture of the Queensland Department of Agriculture replied as follows:—"One firm informs me that they would not accept oranges for cold storage at any price. They have been offered plenty of business, but have reluctantly turned it down. They stated definitely that the taint from oranges affected their cool stores. Another store does not cater for the storage of oranges for the same reasons as stated above. The third store does accept oranges for storage at the present time for the reason that no cheese, butter, or meat is being stored in their cool rooms.

"By the above it would appear that the report as furnished by the shipping companies is established on fact."

Land Cool Storage of Citrus.

The Municipal Cool Storage Works, Sydney, replied as follows:—

We feel certain that under certain conditions the contention advanced is correct, that the flavour of the orange will be absorbed by such produce as eggs, cheese and butter.

We have had no complaint at these stores, always being careful when storing such produce in our rooms not only to see that the rooms have been thoroughly cleaned out and disinfected, but also to store in rooms which are self-contained, and not on a system which may have several rooms served by it.

Conclusions.

The following conclusions may be drawn from these replies:—

1. It is definitely established that the odours of citrus fruits do taint some food products such as butter, cheese, eggs, tea, flour and meat.

2. Certain shipping companies refuse to carry, and some land stores to handle, citrus fruits on account of the danger of taint.

3. Some shipping companies will carry citrus fruits provided that cargoes which will completely fill a hold are forthcoming, and sufficient notice is given to enable the necessary stowage accommodation to be reserved.

4. The trouble may be overcome by installing the direct expansion method of cool storing, together with gas-tight insulation.

BLACK SPOT: A WARNING TO VINEGROWERS.

VINEYARD areas have experienced abnormally heavy rainfalls this winter, with the result that the soils have been wetted to saturation point. If it should so happen that fair spring rains fall, black spot will very likely appear and cause considerable damage to varieties susceptible to it. Last season this disease was prevalent, particularly on irrigated areas, and with numerous resting spores in existence it only remains for spring weather conditions to be moist for the spores to become active and cause a great deal of damage if precautionary measures have not been undertaken.

Considering the winter conditions the country districts are experiencing, it would be folly for anyone to gamble on the spring weather and neglect to swab. Swabbing is most important in combating black spot of the vine. From the results of experiments conducted by the Viticultural Branch of the Department of Agriculture, the vines should be treated prior to bud burst with sulphate of iron-sulphuric acid swab, following up with Bordeaux sprays later. Swabbing is essential for good control, and should not be replaced by winter Bordeaux treatment only.

To safeguard against attacks of black spot preventive measures must be resorted to, and growers should not wait until the disease makes its appearance.—H. L. MANUEL, Viticultural Expert.

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Orchard Notes.

AUGUST.

C. G. SAVAGE AND H. BROADFOOT.

Pest and Disease Control.

San Jose Scale.—It is not too late to spray trees that have not yet commenced to shoot if they are infested with San Jose scale. Strict watch should be kept for this pest. The most effective check can be given by spraying with miscible red oil.

Powdery Mildew.—The removal, where possible, during the winter pruning of all apple twigs affected with powdery mildew will greatly help to keep this fungus in check. This step should be followed by spraying with colloidal, atomised or atomic sulphur.

Leaf Curl.—Peach trees that have not yet been sprayed and have not yet commenced to shoot should receive an application of winter strength lime-sulphur or Bordeaux mixture (6-4-40). The application should be a thorough one, care being taken that the spray reaches out to the ends of the finest laterals.

Grafting.

During the second half of August grafting may be carried out. If the grower has any unprofitable trees he should graft better varieties on to them, but he should take every care in selecting wood for grafting, and use only scions from trees that have proved their fruitfulness and the quality of their fruit. If such care is not taken, the state of the tree after grafting is likely to be worse than in the first instance.

Grafting is used in preference to budding as a method of working many varieties of trees, and old trees are often top-grafted in preference to being budded, for should any of the grafts inserted in the branches fail, a young shoot may be allowed to grow and a bud inserted later on. Top-grafting is generally more successful with apples and pears than with stone fruits.

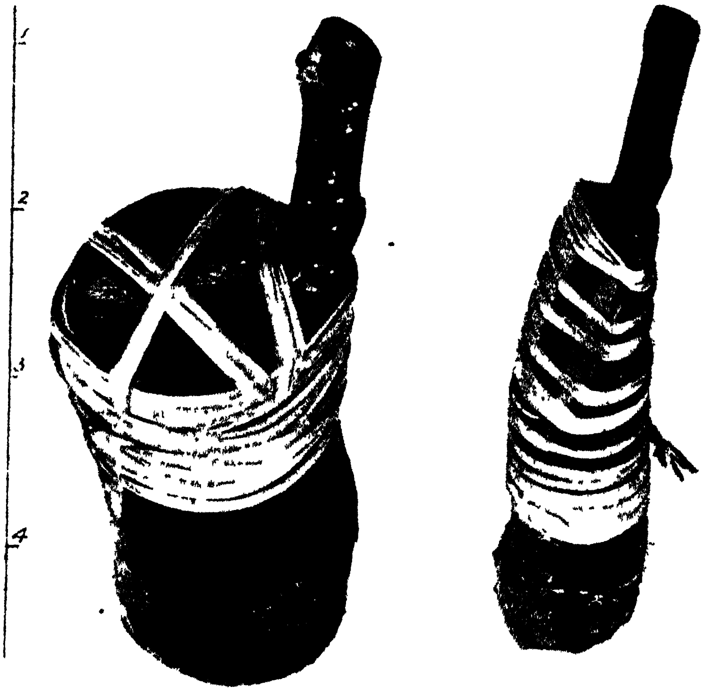
There are several methods of grafting, but the whip graft finds most favour with growers of small stocks. Cleft grafting is used at times for working over old fruit trees, particularly pears, apples, plums, etc. Strap grafting, which is another method of

Bark-grafts.

The ties should come up much higher than shown in this illustration bark grafting, may be used for working over small to medium-sized trees. For this method splitting the limb is not required, but the scion is thrust down between the bark and the wood, and a strip of bark, supported by a thin strip of sap wood, is carried across the top of the wood to be grafted and inserted under the bark on the further side, as shown in the illustration.

Grafting Wax.

Grafting wax is used mainly to exclude the air from the cuts on both stock and scion. and in this way to prevent the scion and the wood of the stock with which it comes in contact from drying before the union is effected. The wax should not be made so hard that it will crack after being applied. The following ingredients should be found satisfactory:—4 lb. resin, 2 lb. beeswax, 1 lb. mutton tallow. Dissolve over a slow fire, and apply with a small brush while warm.



Strap-grafting.
Scions tied and ready for either waxing or claying.

Another formula is: 1 lb. beeswax, 5 lb. resin, 1¾ lb. boiled linseed oil. Farmers' Bulletin No. 63 deals with budding and grafting fruit trees. This bulletin can be obtained from the Department; the price is 10d. posted.

The Thinning of Fruit.

Mr. W. W. Cooke, Orchard Instructor, points out that while August may appear early to speak of hand-thinning fruit—especially pome fruit—this work is often left until too late for the trees to obtain full benefit from this most valuable practice.

The alternate-year habit of cropping—over-production in any one year, which is usually followed by a failure to crop the next year—is becoming a serious menace to the fruit industry. Whilst a lot can be done when pruning to prevent too much blossom being produced, very often such treatment must be supplemented by hand-thinning of the fruit. In fact, with some varieties—Winter Nelis pear, for instance—spur-pruning often causes more fruit to set.

Several striking examples of the good to be derived by removing fruit from trees that have set too great a crop have come under notice during the last two or three years. Cases have occurred where heavy hand-thinning has not only resulted in a great improvement in the size and quality of the fruit harvested, but has enabled the trees to carry a normal crop of fruit the year following. Trees of the same variety in the same district and growing in similar soil not hand-thinned, and which, in consequence, carried too great a crop, produced a very large percentage of under-sized fruit, whilst the following year the crop was practically nil. Thus the trees allowed to over-crop may be said to have failed twice, the first year by producing a crop of unprofitable fruit, and the second, by failing to crop. There is little doubt also that the very heavy crop of small fruit—even when followed by a light crop the year after—exhausts the trees much more than regular but smaller crops of better quality and larger fruit.

It is pleasing to note that in some districts hand-thinning of fruit, especially peaches, is becoming a recognised practice. In districts subject to late frosts rather more fruit wood is left on the trees than necessary to produce a crop consisting of fair-sized fruit. Later, when all danger of frost may be considered past, hand-thinning is resorted to, so as to reduce the amount of fruit to an amount considered desirable, should frost not have done so.

With apricots, hand-thinning has often given excellent results, the increase in price obtained through the increase in size of the fruit more than paying for the labour required to thin out the fruit. It is not always recognised that when trees have set too heavy a crop, reducing the number of specimens on the trees by thinning does not necessarily mean reducing the number of cases harvested, as the increased size of the fruit left on the trees will usually cause it to fill as many cases as would the greater number of smaller specimens from unthinned trees. It is thus possible to obtain improvement in quality without loss of quantity.

If by reducing some of the apples, pears, or peaches on a tree, we can still harvest as many cases the call made on the tree and soil is greatly reduced, as the number of cores and pips or stones is reduced also, and it is these parts of the fruit that require the most plant food, the greater portion of the flesh of the fruit consisting of water.

South African Shipments of Fruit to Canada.

Reporting on the results of two experimental shipments of fresh fruit, comprising peaches, plums, nectarines, pears, and grapes from South Africa to Eastern Canada early this year, the Australian Trade Commissioner in Canada stated that although the fruit sold as a luxury line the experiment would probably lead to substantial developments, and it was hoped ultimately to find some outlet in Eastern Canada for the same class of fruit from Australia. This was dependent, however, on an improvement in the direct steamship connections between Australia and Eastern Canada.

The first shipment comprised 900 cases of peaches for Halifax, and the second 4,043 packages of peaches, 919 packages of plums, 232 packages of nectarines, 3,965 packages of pears, and 225 packages of grapes for Montreal. This second shipment left Capetown on 7th February and was thirty-eight days in transit. The temperature of the fruit when shipped was 39 deg. Fahr. It was carried at 34 deg. Fahr., with a latitude of 1½ deg. up or down. The packages were stowed with vertical battens only between the tiers, horizontal battens between the cases not being required.

The importers stated that the fruit arrived in excellent condition. As regards its subsequent behaviour in the hands of retailers, the report of one particular retailer may be quoted. He stated that he received the fruit in excellent condition. The peaches, however, on being taken out of refrigeration began to droop after about three days, although they were returned to the refrigeration chamber each night. The plums stood up excellently, having been packed in a very green condition. Those inspected were hardly ripe and very hard; they were packed in flat wooden boxes containing about thirty-two plums in a box. Each plum was enclosed in a paper container bearing the name of the packer and featuring the country of origin. They sold 10 cents each retail. The peaches were packed in similar boxes, about eighteen to a box, each wrapped separately in wood-wool without paper wrapping. They sold at 20 cents each retail. The prices received by brokers from wholesalers were as follows:—Plums, 1.50 dollars per box; peaches, 1.25 dollars per box; and grapes, 2.75 dollars per box of 8 lb.

Western Australian Market for Bananas.

Writing in the *Journal of Agriculture* of Western Australia, Mr. F. J. S. Wise, Tropical Adviser to the Department of Agriculture in that State, points out that while the market for bananas in the eastern Ausraliar states is well supplied, the people in Western Australia are mostly "starving for bananas." He also draws attention to the fact that the consumption of bananas in America amounts to 25 lb. per head per year, while the Australian consumption is under 10 lb.

Poultry Notes.

AUGUST.

E. HADLINGTON, Poultry Expert.

Feeding Experiments at Hawkesbury Agricultural College.

DURING 1928, at the request of the Poultry Farmers' Union, a series of tests was commenced at Hawkesbury Agricultural College with feeding a balanced all-mash ration from the time the chickens were hatched until the end of the first laying season. It was desired that the ration should comprise approximately 50 per cent. pollard and bran and a like proportion of ground grains, together with the necessary concentrates to balance the ration In all, three experiments have so far been conducted, two commencing in 1928 and one in the following year. The experiments were conducted by Mr. C. Lawrence, Poultry Instructor at Hawkesbury Agricultural College, under the supervision of the Principal (Mr. E. A. Southee) and the writer.

As the ingredients in the proposed ration were in the same proportions as in the ordinary ration recommended by the Department, it was decided, for purpose of comparison, to use the same ingredients as in the Departmental ration, except that the grain portion of the ordinary ration would be ground into a meal and incorporated with the pollard, bran, &c., in the case of the "all-mash" ration.

The ration was made up as follows:—

Ration up to 12 weeks.		Ration, 12 to 24 weeks.		Adult Ration.	
Pollard	46 lb.	Pollard	43 lb.	Pollard	32 lb.
Bran	23 ,,	Bran	22 ,,	Bran	16 ,,
Wheat	14 ,,	Wheat	22 ,,	Wheat	33 ,,
Maize	7 ,,	Maize	11 ,,	Maize	16 ,,
Oats	3 ,,	Meat meal	2 ,,	Meat meal	3 ,,
Skim-milk powder	4 ,,		100 ,,		100 ,,
Bone meal	3 ,,	Salt	12 oz.	Salt	12 oz.
	100 ,,				
Salt	12 oz.				

Particulars of Experiment in 1928.

Two separate tests were commenced in 1928, one on 27th August and the other on 18th September. Five hundred chickens were used in the first (Section 1) and 200 in the second (Section 2), both lots being equally divided as regards numbers, breeding, &c., but fed by different systems.

The birds were weighed each month until they were seven months old, and the table following shows the average weights at each period in Sections 1 and 2.

WEIGHTS of Chickens in Sections 1 and 2 up till seven months old.

Wet-mash Group.				All-mash Group			
Date Weighed.	Birds.	Average Weight.		Date Weighed.	Birds.	Average Weight.	
Section 1.							
		lb.	oz.			lb.	oz.
24 September, 1928 ...	231	0	4·1	24 September, 1928...	236	0	3·8
22 October. „ ...	231	0	12·7	22 October, „ ...	225	0	11 7
21 November, „ ...	229	1	9·0	21 November, „ ...	217	1	9·36
19 December, „ ...	110	2	0·6	19 December, „ ...	110	2	2·3
16 January, 1929 ...	110	2	13·2	16 January, 1929...	110	2	9·0
28 February, „ ...	107	3	4 5	28 February, „ ...	108	3	0·0
31 March, „ ...	80	3	10·6	31 March, „ ...	80	3	7·6
30 April, „ ...	80	3	12·8	30 April, „ ...	80	3	7·2
Section 2.							
		lb.	oz.			lb.	oz.
16 October, 1928 ...	95	0	4·5	16 October, 1928 ...	89	0	4·76
31 November, „ ...	92	0	11 5	31 November, „ ..	84	0	12·2
10 December, „ ...	90	1	9·0	10 December, „ ...	83	1	8·6
8 January, 1929 ...	43	2	2·6	8 January, 1929 ...	44	2	1·0
28 February, „ ...	40	2	13·6	28 February, „ ..	40	2	12·0
31 March, „ ..	40	3	4 8	31 March, „ ...	40	2	15·0
30 April, „ ...	40	3	11·6	30 April, „ ...	40	3	4·4

In Section 1 it will be noted that the wet-mash group showed a higher average weight, except for the months of November and December. while in the Section 2 those of the all-mash group weighed heavier during the first two months only, and the wet-mash group gained considerably during the other months

The mortality, as will be seen from the figures, was somewhat higher in the wet-mash group of Section 1 during the first month, but in the second month a greater number of deaths occurred in the all-mash group, while in Section 2 the losses in the all-mash birds were higher right throughout. During the rearing stage the appearance of the wet-mash groups was superior to that of the all-mash birds, and at times trouble was experienced with many of the all-mash chickens through their beaks becoming clogged with the mash.

At three months of age the pullets were separated from the cockerels, only the pullets being left in the experiment. Later it was found necessary to reduce the numbers in each group owing to lack of accommodation in the experiment pens

In Section 1 the birds in each group were divided into two lots of forty on 1st March, 1929, and on 1st July, 1929, were again subdivided into pens of ten birds each.

The birds in Section 2 were similarly divided on 1st February, 1929, making two pens of twenty in each group, and on 1st July, 1929, these were also separated into lots of ten.

Egg Production.

The pullets of the wet-mash group in Section 1 commenced to lay on 16th January, 1929, and those of the all-mash group started a month later (on 11th February), while those in Section 2 began to lay in April, the wet-mash birds on the 8th and those of the all-mash group on the 17th.

Following is the monthly record of egg production, adjusted, in accordance with the usual practice in such experiments, to make allowance for mortality from month to month :—

SUMMARY of Egg-laying.

	Section 1.		Section 2	
	Wet-mash Group (80 Birds)	All-mash Group (80 Birds)	Wet-mash Group (40 Birds).	All-mash Group (40 Birds).
Date Hatched ..	27 August, 1928		18 September, 1928	
Commenced to Lay ...	16 January 1929.	11 February, 1929.	8 April, 1929.	17 April, 1929.
	No. of eggs.	No. of eggs.	No. of eggs.	No. of eggs.
1929.				
February	166	36	..	...
March	257	183	...	...
April	726	610	167	42
May	523	526	321	191
June	988	492	414	174
July	537	501	363	194
August	1,273	1,265	693	488
September	1,588	1 487	805	668
October	1,515	1,505	802	708
November	1,366	1,224	708	559
December	1,214	1,165	654	495
1930.				
January	994	1,030	551	513
February	698	883	412	335
March	485	688	215	189
Total	12,330	11,595	6,105	4,556
Average per bird...	154	145	152	114
Value	£ s. d. 77 10 1	£ s. d. 70 18 9	£ s. d. 37 16 0	£ s. d. 26 13 3

There are some interesting features in connection with the incidence of production. The wet-mash group in Section 1 kept ahead of the all-mash birds right through to January, 1930, and in the three concluding months the latter group showed a substantial increase, but the wet-mash group averaged nine eggs per bird more for the year. On the other hand, the wet-mash birds in Section 2 kept in the lead all through the year and finished with an average of 152 eggs, compared with 114 for the all-mash group, or thirty-eight eggs per bird in favour of the former. The wet-mash group showed a margin of £6 11s. 4d. over the all-mash birds in Section 1, and in Section 2 the wet-mash birds also led by £11 2s. 9d.

Comparative Costs of Feeding.

The cost of feeding has been divided into two parts—from time of hatching to the commencement of the twelve-months' laying period, and during the twelve-months' laying ending 31st March. The cost is in favour of the all-mash group to the extent of approximately £4 in Section I and £1 19s. in Section II. The food consumption was higher for the wet-mash groups, but owing to the extra cost of ground grain in the all-mash groups, the cost is much the same over the whole test.

Particulars are given below :—

FOOD Consumption and Cost—Section I.

	Food Consumed (27 Aug., 1928 to 31 Mar., 1929).		Food Consumed (1 April, 1929, to 31 Mar., 1930).		Total Cost.
	Weight.	Cost.	Weight.	Cost.	
	lb.	£ s. d.	lb.	£ s. d.	£ s. d.
Wet mash ...	4,176	18 5 1	6,805	30 3 3	48 8 4
All mash ...	3,629	15 19 9	6,163	28 8 3	44 8 0

NOTE.—Date hatched, 27th August, 1928.

FOOD Consumption and Cost—Section II.

	Food Consumed (18 Sept., 1928, to 31 Mar., 1929).		Food Consumed (1 April, 1929, to 31 Mar., 1930.)		Total Cost.
	Weight.	Cost.	Weight.	Cost.	
	lb.	£ s. d.	lb.	£ s. d.	£ s. d.
Wet mash ...	1,868	8 1 5	3,268	14 15 2	22 16 7
All mash ...	1,580	7 6 11	2,908	13 10 3	20 17 2

NOTE.—Date hatched, 18th September, 1928.

PROFIT over Cost of Feed during Twelve-months' Laying Period.

Period 1 April, 1929, to 31 Mar., 1930.	Wet Mash.	All Mash.
Section 1.		
	£ s. d.	£ s. d.
Value of eggs	74 12 5	69 6 5
Cost of feed	30 3 3	28 8 3
Profit (Section 1) ... £	44 9 2	40 18 2
Section 2.		
	£ s. d.	£ s. d.
Value of eggs	37 16 0	26 13 3
Cost of feed	14 15 2	13 10 3
Profit (Section 2) ... £	23 0 10	13 3 0

NOTE.—In computing these costs, freight and cartage were not taken into account, but this does not affect the figures from the point of view of comparison.

The Second Year's Test.

Commencing in July, 1929, a further test was undertaken with 700 chickens, care being taken that the chickens in each group were as even as possible in every way. In this experiment an additional group was added in order to compare the results from dry-mash feeding with the other two systems.

The same ingredients and proportions were used for the different groups as in the previous tests. The dry-mash group was given the dry-mash in hoppers in the same way as the all-mash group, and grain was fed in the evenings as in the case of the wet-mash group.

Condition of Chickens during Brooding Stage.

During the brooding stage there was very little difference in the appearance of the various groups, but in the dry-mash group toe-picking commenced when the chickens were a month old. The salt-content of the ration was therefore increased to 18 oz. per 100 lb. of feed, after which improvement was shown.

During the time the chickens were in the brooder a small number in the dry-mash and all-mash groups suffered from sore eyes and clogging of their beaks with food, but the number affected was less than in the previous experiment.

WEIGHTS of Birds in the various Groups up to Seven Months.

All-mash Group			Wet-mash Group			Dry-mash Group.		
Date	Birds	Average Weight	Date	Birds	Average Weight	Date	Birds.	Average Weight.
		lb. oz.			lb oz.			lb. oz.
9–10–29	183	0 9·3	9–10–29	190	0 9	9–10–29	186	0 9·1
20–11–29	180	1 5·6	20–11–29	187	1 5	20–11–29	181	1 6·5
28–2–30	89	2 14·4	28–2–30	87	3 4	28–2–30	88	2 15·5

The variations in weight between the various groups for the different periods are somewhat striking. It will be noted that at the first weighing the wet-mash chickens averaged slightly less than either all-mash or dry-mash birds, and that those in the all-mash group were the heaviest. In the second weighing the wet-mash group was still the lowest, while the dry-mash birds were heavier than those receiving all mash. However, in the third period the wet-mash group showed a marked increase over both the other groups, averaging 4½ oz. higher than the dry-mash group and 5½ oz. higher than the all-mash lot. The mortality during the first few months was highest in the all-mash group and lowest in the wet-mash birds.

The same procedure as in the previous tests was followed with regard to separating the pullets from the cockerels and retaining only the pullets for the remainder of the experiment, and later on the pullets were divided into two lots of forty-four and forty-five in each group. In June they were further subdivided into eight lots of ten each in the various groups, and continued thus to the end of the experiment, except for the deaths which occurred from month to month.

Egg Production.

Egg production commenced about the same time in each group, the first eggs being laid on the 24th January, 1930, by the wet-mash birds, on 25th January by the all-mash group, and on 27th January by the dry-mash group.

Comparative Costs of Feeding.

The cost of feeding has been divided into two parts—from time of hatching to the commencement of the twelve-months' laying period, and during the twelve-months' laying ending 31st March. The cost is in favour of the all-mash group to the extent of approximately £4 in Section I and £1 19s. in Section II. The food consumption was higher for the wet-mash groups, but owing to the extra cost of ground grain in the all-mash groups, the cost is much the same over the whole test.

Particulars are given below :—

FOOD Consumption and Cost—Section I.

	Food Consumed (27 Aug., 1928, to 31 Mar., 1929).		Food Consumed (1 April, 1929, to 31 Mar., 1930).		Total Cost.
	Weight.	Cost.	Weight.	Cost.	
	lb.	£ s. d.	lb.	£ s. d.	£ s. d.
Wet mash ...	4,176	18 5 1	6,805	30 3 3	48 8 4
All mash ...	3,629	15 19 9	6,163	28 8 3	44 8 0

NOTE.—Date hatched, 27th August, 1928.

FOOD Consumption and Cost—Section II.

	Food Consumed (18 Sept., 1928, to 31 Mar., 1929)		Food Consumed (1 April, 1929, to 31 Mar., 1930.)		Total Cost.
	Weight.	Cost.	Weight	Cost.	
	lb.	£ s. d.	lb.	£ s. d.	£ s. d.
Wet mash ...	1,868	8 1 5	3,268	14 15 2	22 16 7
All mash ...	1,580	7 6 11	2,908	13 10 3	20 17 2

NOTE.—Date hatched, 18th September, 1928.

PROFIT over Cost of Feed during Twelve-months' Laying Period.

Period 1 April, 1929, to 31 Mar., 1930.	Wet Mash.	All Mash.
Section 1.	£ s. d.	£ s. d.
Value of eggs	74 12 5	69 6 5
Cost of feed	30 3 3	28 8 3
Profit (Section 1) ... £	44 9 2	40 18 2
Section 2.	£ s. d.	£ s. d.
Value of eggs	37 16 0	26 13 3
Cost of feed	14 15 2	13 10 3
Profit (Section 2) ... £	23 0 10	13 3 0

NOTE.—In computing these costs, freight and cartage were not taken into account, but this does not affect the figures from the point of view of comparison.

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Commencing in July, 1929, a further test was undertaken with 700 chickens, care being taken that the chickens in each group were as even as possible in every way. In this experiment an additional group was added in order to compare the results from dry-mash feeding with the other two systems.

The same ingredients and proportions were used for the different groups as in the previous tests. The dry-mash group was given the dry-mash in hoppers in the same way as the all-mash group, and grain was fed in the evenings as in the case of the wet-mash group.

Condition of Chickens during Brooding Stage.

During the brooding stage there was very little difference in the appearance of the various groups, but in the dry-mash group toe-picking commenced when the chickens were a month old. The salt-content of the ration was therefore increased to 18 oz. per 100 lb. of feed, after which improvement was shown.

During the time the chickens were in the brooder a small number in the dry-mash and all-mash groups suffered from sore eyes and clogging of their beaks with food, but the number affected was less than in the previous experiment.

WEIGHTS of Birds in the various Groups up to Seven Months.

All-mash Group				Wet-mash Group.				Dry-mash Group.			
Date.	Birds.	Average Weight.		Date	Birds	Average Weight.		Date.	Birds.	Average Weight.	
		lb.	oz.			lb	oz.			lb.	oz.
9-10-29	183	0	9·3	9-10-29	190	0	9	9-10-29	186	0	9·1
20-11-29	180	1	5·6	20-11-29	187	1	5	20-11-29	181	1	6·5
28-2-30	89	2	14·4	28-2-30	87	3	4	28-2-30	88	2	15·5

The variations in weight between the various groups for the different periods are somewhat striking. It will be noted that at the first weighing the wet-mash chickens averaged slightly less than either all-mash or dry-mash birds, and that those in the all-mash group were the heaviest. In the second weighing the wet-mash group was still the lowest, while the dry-mash birds were heavier than those receiving all mash. However, in the third period the wet-mash group showed a marked increase over both the other groups, averaging 4½ oz. higher than the dry-mash group and 5½ oz. higher than the all-mash lot. The mortality during the first few months was highest in the all-mash group and lowest in the wet-mash birds.

The same procedure as in the previous tests was followed with regard to separating the pullets from the cockerels and retaining only the pullets for the remainder of the experiment, and later on the pullets were divided into two lots of forty-four and forty-five in each group. In June they were further subdivided into eight lots of ten each in the various groups, and continued thus to the end of the experiment, except for the deaths which occurred from month to month.

Egg Production.

Egg production commenced about the same time in each group, the first eggs being laid on the 24th January, 1930, by the wet-mash birds, on 25th January by the all-mash group, and on 27th January by the dry-mash group.

Particulars of the egg-laying, adjusted on the same basis as in the previous experiment, are given below:—

SUMMARY of Egg-laying, 1929–30–31.

	All-mash Group (80 Birds).	Dry-mash Group (80 Birds).	Wet-mash Group (80 Birds).
1930.			
January	7	16	4
February	59	121	106
March	197	285	532
April	422	594	879
May	352	484	477
June	261	416	470
July	478	561	777
August	1,271	1,265	1,317
September	1,577	1,473	1,518
October	1,594	1,511	1,623
November...	1,372	1,314	1,490
December	1,119	1,029	1,224
1931.			
January	939	757	1,111
February	905	636	843
March	566	396	549
Total	11,119	10,858	12,920
Average per bird ...	139	136	162
Value...	£ s. d. 56 11 9	£ s. d. 56 17 9	£ s. d. 69 15 0

NOTE.—The birds were hatched on 26th July, 1929, and 28th July, 1929.

It will be noted that the wet-mash group laid a much higher average number of eggs than either the all-mash or dry-mash group, showing an average difference of twenty-three eggs per bird more than the all-mash and twenty-six eggs per bird higher than the dry-mash group. As regards value of eggs, the wet-mash group exceeded the other two groups, being £13 3s. 3d. above the all-mash group and £12 17s. 3d ahead of the dry-mash birds.

As in the previous tests the wet-mash group laid a somewhat lower number of eggs than the all-mash birds during February and March, 1931, but in all other months, except September, when the production was slightly lower again than in the all-mash group, they laid considerably more than the all-mash or dry-mash group. The dry-mash birds laid more eggs each month up to July than did the all-mash group, but from July till March the all-mash birds did better than those on dry mash.

Cost of Feeding.

As in the previous experiments the cost of feeding is shown over two periods, *i.e.*, from hatching time until the beginning of the twelve months' laying period, and then covering the twelve months laying.

Particulars are as follows:—

FOOD Consumed and Cost of Feeding.

	Food Consumed (28 July, 1929, to 31 March, 1930).		Food Consumed (1 April, 1930, to 31 March, 1931).		Total Cost.
	Weight.	Cost.	Weight.	Cost.	
	lb.	£ s. d.	lb.	£ s. d.	£ s. d.
All-mash Group ...	1,592	16 12 2	6,474	22 17 2	39 9 4
Wet-mash Group ...	1,688	17 14 9	6,320	21 19 0	39 13 9
Dry-mash Group ...	1,548	16 8 2	5,954	20 9 3	36 17 5

NOTE.—Date hatched, 28th July, 1929.

It will be noted that in the all-mash and wet-mash groups the cost of feeding was approximately the same over the whole period, while the dry-mash cost approximately £3 less.

PROFIT over Cost of Feed during Twelve months' Laying Period.

	All-mash Group.	Dry-mash Group	Wet-mash Group.
	£ s. d.	£ s. d.	£ s. d.
Value of eggs laid, 1st April, 1930, to 31st March, 1931.	54 18 0	54 4 3	65 11 1
Cost of feed	22 17 2	20 9 3	21 19 0
Profit ... ... £	32 0 10	33 15 0	43 12 1

Condition of Birds Throughout the Test.

Notes were made of the condition of the birds at intervals in the various groups, and particulars are given as follows:—

At the end of January, 10 per cent. of the birds in the all-mash group were showing chicken pox lesions, and the condition of the birds in the wet-mash group was slightly superior to those in the dry-mash group, and much better than those in the all-mash group.

On 28th February moulting was about equal in each group, but egg production was highest in the dry-mash group and lowest in the all-mash group. At the end of March the condition of the birds fed on wet mash was much fresher than those of the other two groups, and the birds receiving all mash were moulting heavier than those on either dry mash or wet mash. The egg production from the wet-mash group was greater than the other pens, and the dry-mash pens laid considerably more than the all-mash. .

During April, the condition of the birds and egg production were much the same as in March.

In May there was practically no difference in the appearance of the birds in any of the groups, and the majority of the birds were getting over the moult.

Throughout the flush season of laying there was very little variation in the condition of the birds in any of the groups. At the end of January, 1931, the birds in the dry-mash group began to fall off in condition and commenced to moult. Those in the all-mash pens were slightly better in condition than those fed on the dry mash, but the wet-mash pens showed much better condition and the egg production was much higher than the rest. There was very little change during February, except that the dry-mash birds were moulting heavier than the others. In March the birds in the all-mash and wet-mash pens showed no change in condition, but the dry-mash birds were showing a heavier moult than the other two groups. At the end of March the wet-mash birds were much superior in appearance to the other groups, and were recovering from the moult much more quickly.

Experiment to be Continued.

At the end of the twelve-months' laying period three pens of ten birds each were selected from the different groups, and it is intended to carry on the test with these for another twelve months laying.

Summary of the Results.

In the three separate experiments the wet-mash groups have shown a much higher average production than either the all-mash or dry-mash birds.

In the first two experiments the cost of feeding was higher for the wet-mash pens than for the all-mash groups, and in the third test the cost of feeding for the all-mash group was slightly higher than for the wet-mash or dry-mash pens, yet the return over cost of feed was much greater from the wet-mash birds than from the other two groups.

There was very little difference in the mortality during the laying period between the different groups in all three experiments.

REPORT OF WORLD'S POULTRY CONGRESS.

AN advance copy of the Report of Proceedings of the World's Poultry Conference that was held in London last year, and at which New South Wales was officially represented, has come to hand from the Ministry of Agriculture and Fisheries, England.

This report contains copies of all papers read at the conference and an account of the discussions. The authors of these papers include leading experts from all over the world, and they present not only the latest information on the science, practice and economics of the poultry industry, but on the action taken by Government authorities in different countries to assist and develop the poultry industry. We note among the authors of papers such world-wide authorities as Prof. R. C. Punnett, of Cambridge University, Dr. A. Morley Jull, of U.S.A. Bureau of Animal Industry, Dr. J. B. Orr, of the Rowett Research Institute of Scotland, Dr. Leo F. Rettger of Yale University, Dr. Miessner of Germany, and others.

The report is not only of immediate interest to those in the poultry industry, but should prove a valuable work of reference for state authorities, educational and research institutions, and others.

The report also contains a series of papers on the rabbit industry and various aspects of rabbit culture.

Copies are obtainable from H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price 10s. 6d.

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1st September, 1931.

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VOL. XLII. PART 9. SEPTEMBER 1, 1931.

Agricultural Gazette of New South Wales.

The Wheat Growing Industry.

CAN THE INTENSIFIED COMPETITION BE MET ?

E. S. CLAYTON, H.D.A., Senior Experimentalist *

WHEAT is by far the most important revenue producing crop grown in New South Wales. It is greater in value than all other crops combined. In 1928-29 the value of the wheat crop was £11,900,000, which was nearly 60 per cent. of the total agricultural output for the year. To appreciate the importance of the industry it is necessary to take into consideration also the large rural population and the great land developments and settlements that are almost entirely dependent on wheat. The wheat export industry is indispensable to the progress of the State and the Commonwealth, and if the world price is to continue at its present low figure it will be necessary to make whatever adjustments are needed to make this low price show a profit.

The problem of low world price cannot be avoided, so far as Australia is concerned, by reducing the area under wheat until it is only sufficient to produce local requirements. This would be financially disastrous to the State. Apart from other considerations, it would even be extremely risky for the reason that wheat production is dependent on the vagaries of the season, and, consequently, annual production varies greatly. It is even necessary to cater for the export trade in order to ensure that local needs are fully supplied in the inevitable drought years. In such years, if areas were restricted to meet normal local requirements, the State would actually be forced to import wheat Even as it is, with no thought of restricting areas, on one occasion (in 1919-20) total production fell much below home requirements. In that year, because of the drought, only 4,000,000 bushels were produced, whereas 13,000,000 to 17,000,000 bushels are normally required for local use.

Cost of Production.

The outstanding need is for the cost of production to be reduced to enable farmers to meet the altered world conditions. If the price remains low it will be necessary to so reduce costs that it becomes possible to sell still larger amounts to China, Japan, and the tropics generally, where consumption of wheat is low, but is likely to be increased by low prices. The cost per acre of growing wheat varies very little on an individual farm from year to year, but the cost per bushel varies greatly from season to season, even on the same farm. The yield per acre is mainly responsible for this variation. Seasonal peculiarities certainly influence yields, but as the grower has no control over these, it becomes all the more necessary for him to concentrate on those factors within his control. He must aim, therefore, at improving the acre yields by every means at his command.

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* Report of an address delivered by Mr. Clayton at the recent annual conference of the Agricultural Bureau of New South Wales.

Interest and depreciation charges become proportionately very heavy when the acre yields are relatively low; an increase in yield gives some relief from the burden. Increased yields seem to be the way out for the man on the high-priced land in the good rainfall districts. In the drier districts, where land values are lower and yields smaller, it may be possible to increase slightly the yields, but most relief from the overhead expenses must come from an increase in crop area, which, to be effective, must be obtained without any decrease in acre yield. It is most imperative that in these drier parts a sufficiently large area be cropped to utilise the farming plant to full capacity. To show a profit in the driest part of the wheat belt the farmer must skim the low yields from a large area. On much of the mallee lands in the dry areas in New South Wales the soils are light in texture, and the cost of tillage relatively low, making it possible, therefore, to crop larger unit areas. Provided the land values are low, cropping may be profitable on much lower acre yields than in other districts. The only way in which wheat can be made to pay on these light lands, and, in fact, on all the land in the driest parts of the State, is by keeping the capital values down. Once land values become high, profitable farming is out of the question.

Standardised Methods.

There is still too much difference in the methods employed by individual farmers in the same district, and a development that would quickly lift our average yield from its present low figure would be the adoption by all the farmers in a district of what might be called a "standard method" for that district. The standard method should be that actually practised by the most successful farmers in the district. The time is opportune, and the organisations capable of tackling this problem are in existence. It would render a great service to the industry and to the individuals engaged in it, and the work of determining these "standard methods" could be undertaken by branches of the Agricultural Bureau, Farmers and Settlers' Association, and other similar bodies. The weight of the approval of such reliable bodies of practical men would go a long way towards ensuring the widespread adoption of the final recommendations. Included could be a decision on every factor affecting cropping, such as rotation, fallowing, details of cultivation, time of sowing, amount of seed and fertiliser, varieties, and in fact every detail connected with production. Nothing but good could result from such a full discussion of methods, and the standard could always be open for modification and improvement.

Grow Wheat on Fallow.

The low average yield is probably due more to the high percentage of stubble land cropped than to any other single factor. On an average only about half the area cropped in this State is shown as fallowed land. In this connection results of field experiments at Wagga Experiment Farm are of interest. The average wheat yield on continuously cropped stubble land was 11 bushels, as compared with 23 bushels on winter fallowed land. A very marked difference was always noticeable between the two treatments and the stubble plots gradually became more and more infested with black oats and foot-rot, and yields declined until the treatment had to be discontinued. Now, Wagga district is considered a favourable one, the average rainfall is 21 inches, and for the growing period (April to October, inclusive) the average is 13.8 inches, and yet fallowing gave an average increase in yield of 12 bushels per acre. In the drier districts, moisture is of more importance as a limiting factor in crop production, and, consequently, fallowing is even more essential, yet in many of the driest districts great areas are sown on non-fallowed land.

A substantial extension of fallowing, more especially in the dry districts, is now necessary. It is one of the best means of reducing the cost of production. Stubble cropping, except where the climatic conditions are particularly favourable, is less profitable than fallowing, and, faced with low wheat prices, farmers in dry districts cannot afford to grow wheat on stubble land. Stubble cropping should only be practised under special circumstances, such as in pioneering districts, where the grower has insufficient cleared land to utilise the plant fully

The next advance should be in the improvement of the fallows. In the area now classed statistically as fallow is a large proportion of indifferent fallow, where the land has not been worked to the best advantage, with the result that the full benefit of fallowing has not been obtained. While low wheat prices prevail a great number of workings of the fallow cannot be recommended, as this may increase the cost of production beyond the margin of profit, but with judgment it is possible to cultivate the fallow to good advantage and at the most opportune time, while at the same time keeping the number of cultivations down to a minimum.

On these points, the field experiments at Wagga Experiment Farm offer some guidance. Long summer fallow and winter fallow were tested, also different methods of cultivating the fallow, and it was found that, in the Wagga district, long summer fallowing did not profitably improve the yield over winter fallowing, and need not therefore be carried out except as a means of eradicating black oats. Winter fallow gave an average yield of 21 bushels, while long summer fallow only yielded 20 bushels. Much the same result was obtained in the experiments at Temora, where land ploughed in June and July gave the most satisfactory results. The experiments showed that the cultivation in spring (August) is very necessary. When it was omitted and the fallow was not cultivated until February, and then again in March the average yield was 16 bushels; where the fallow was cultivated in August, October, February, and March the average yield was 21 bushels, so that the yield apparently was increased by 5 bushels by the spring working.

Valuable guiding principles as to fallow working can be given, but methods will, of course, be governed by the season and the condition of the fallow. In this matter much depends on the judgment of the grower. He should, therefore, have a very clear conception of just what final soil condition of the fallow he is working for, and all the cultivations can be planned towards that end.

To summarise, it has been shown that in the southern districts the spring cultivation is very necessary, so also are those in February and March, and if it is necessary because of low wheat prices to cut expenses by reducing the number of cultivations, the reduction should be made between the August and February cultivations.

Diversification in Farming.

Growers must realise that "one crop" farming is risky, and in the more favoured districts where the rainfall makes a change possible, they should get away from growing wheat exclusively and give more attention to livestock farming.

Except in the case of oats, there has been great difficulty in finding suitable crops for the wheat belt, but some advance has been made in this direction. The successful introduction of lucerne into wheat areas has opened up great possibilities. It has rendered diversification possible, and fat lamb raising, dairying, and pig raising are now becoming more popular. In favoured districts a considerable area can be profitably sown to lucerne and fodder crops to provide winter feed. Field peas also offer good possibilities. Such a system of farming is an improvement on single cropping, where the annual income is necessarily dependent on a single crop against which both the seasons and the markets may operate unfavourably. Even if the area sown to wheat is reduced on individual farms in the favoured districts the increase in acre yields as a result of the greater activity with livestock is likely to reduce greatly the cost of production per bushel. As a result of the better farming practices which diversification makes possible it is not unreasonable to assume that the same quantity of wheat could be produced in spite of the reduced area sown to that crop.

We have much evidence of the ill-effects of one-crop farming. For example, on the fertile southern slopes, where the country is undulating, there is an increasing loss of soil by surface washing and gulleying each year. Throughout practically the whole of the wheat belt an increase in crop enemies can be noticed. One-crop farming certainly seems to favour the increase of flag smut, take-all, and foot-rot.

Satisfactory diversification is only possible in fairly favoured districts. In the semi-arid portions of the wheat belt, wheat must continue to be the main consideration. Advancement here must be along the lines of greater efficiency and reduced costs. Here, stubble farming should be taboo. This country can only be successfully farmed in large areas and with the largest possible equipment. Unit areas should be sufficiently large to permit the use of large machines working at full capacity.

Before leaving the subject of diversification, it is interesting to note the extent to which oats are grown in certain districts, while other wheat areas are backward in this respect. In 1928-29 the area sown to oats in the

Riverina was 130,000 acres, and on the south-western slopes 116,000 acres; but on the central-western slopes and north-western slopes, only 15,000 acres and 3,000 acres, respectively, were sown.

Grow Suitable Varieties.

There is still room for great improvement in yield by growing more suitable varieties. Let us consider the areas sown in New South Wales to the leading varieties. The latest available figures (1929-30 season) show Waratah leading with 817,000 acres. This variety is of high merit and its performance justifies its being sown on a large area. Federation occupies 679,000 acres, notwithstanding that there are varieties capable of outyielding Federation in practically every district of the State. It is rapidly losing favour in the Wagga district, where Baringa has given an average yield of 6 bushels more per acre. At this centre it is also definitely inferior to Ford, Numba, Nizam, Yandilla King, Duchess, Exquisite, and a number of other varieties. At Cowra it is inferior to Dundee, Burrill, Baringa, Ford, Nabawa, Yandilla King, and other varieties. For the last three years at Cowra Federation has given an average yield of 19 bus. 33 lb. per acre, while Dundee for the same years has average 29 bus. 52 lb., a difference of 10 bushels per acre. Even in the moderately dry districts, which are relatively more favourable to Federation, we find the variety outclassed. At Trangie it gave an average yield of 21 bus. 53 lb. against Baroota Wonder with an average yield for the same years of 25 bus. 50 lb. It is also excelled at Trangie by Nabawa, Dundee, Burrill, Baringa, Ford, and others. In the driest parts of the wheat belt it is too late in maturity to give good yields. At Condobolin it is quite outclassed by such varieties as Bobin, Nabawa, Duri, Waratah, Gluyas, and Girral.

The evidence supplied by departmental field experiments is that Federation could be replaced in practically every district of the State by other varieties capable of giving heavier yields. That an old favourite like Federation should pass into the discard is not to be deplored, for it is a sign of great progress when a wheat that has been such a favourite for years can be so convincingly outyielded by newer productions. The strong point of Federation, apart from its drought resistance, is its freedom from shelling and lodging, but many of the new varieties also possess these characteristics and, at the same time, are not so liable to disease.

Yandilla King was sown on 431,000 acres in 1929-30. It is very adaptable and has given good results. Turvey sown on 281,000 acres is too widely used. Although this variety is fairly popular in the eastern portions of the Riverina and south-western slopes, its performance does not justify the sowing of quite such a large area. At Wagga, its great stronghold, it is outclassed by Yandilla King, Duchess, Exquisite, Nizam, Baringa, Numba, and Ford. At Temora the variety has been tested for the past five years and it is outyielded by Yandilla King, Duchess, Burrill, Cowan, Craboon, Exquisite, Ford, and Baringa. In the drier districts Turvey cannot compare with the more drought-resistant varieties.

Canberra was grown on 236,000 acres. This variety is very susceptible to disease, has weak straw, and is being gradually replaced by better varieties. At Wagga it is surpassed by Bobin, Duri, Gular, Rajah, Bald Early, Waratah, Nabawa, and Aussie; at Temora by Bobin, Duri, Waratah, Aussie, and Nabawa; at Trangie by Bobin, Cookapoi, Duri, Nabawa, Silver Bart, and Waratah. Canberra's last stronghold is in the driest districts of the State, but even here it has been challenged. At Condobolin Cookapoi and Duri are slightly superior, but Canberra still deserves a place on the outer edge of the wheat belt.

Of Nabawa, 203,000 acres were sown. This variety is deservedly gaining in popularity, and the area sown to it could with profit be greatly increased. There were 195,000 acres sown to Bena. This variety can be outclassed at all centres. At Wagga during the past six years its average yield was 26 bushels, while that of Baringa for the same period was 30 bushels. It is also outclassed here by Duchess and Numba. Bena has given some of its biggest yields at Cowra in goods seasons, but even at this centre, where it has been tested for nine years, it is inferior to Dundee and Burrill. In drier districts to which Bena is less adapted there are varieties available that have consistently outclassed it by 6 bushels per acre.

An area of 126,000 acres of Penny, 108,000 Union, and smaller areas of Purple Straw and Minister are sown. These varieties could very largely be replaced by superior wheats. There is even 3,000 acres each of Steinwedel and Comeback. Neither of these varieties should be grown at all, as greatly superior wheats for both hay and grain are available.

Areas of 9,000 acres of Baroota Wonder, 6,000 acres to Duri, 4,000 acres to Bobin, and 3,000 acres to Ford were sown. These are all excellent varieties and the area sown to them could, with advantage, be greatly increased. They, with Nabawa, could largely replace Federation, Canberra, Penny, and Union.

Grow Flag-smut Resistant Varieties.

Flag smut takes heavy toll of the wheat crops in New South Wales. Instances of crops being reduced by 2 or 3 bushels per acre are quite common throughout the wheat belt. One of the best means of avoiding loss from this disease is to grow resistant varieties. The newly introduced variety Nabawa has shown remarkable resistance to flag smut, and this factor has been largely responsible for its increasing popularity. In the 1929 season, as already stated, 203,000 acres were sown to this variety, and there is evidence that a still greater area was sown in 1930. In addition to this desirable characteristic, Nabawa also has the ability to yield well over a wide range of wheat soils and climatic conditions, and consequently it could be grown over a very large area of the State and on much of the area at present devoted to flag-smut liable varieties such as Federation, Canberra, Hard Federation and Union. It is thought that a further increase in the area sown to flag-smut resistant varieties such as Nabawa would result in an improvement in the State's average yield.

Improve the Average Yield for the State.

Chiefly because of climatic conditions the average yield in Australia is below that of other countries. Our chief disadvantage is low rainfall combined with dry winds in the spring.

The following are the average yields of wheat per acre for the five-year period 1924-1928 of some of the wheat-growing countries:—Great Britain 31.9 bushels, New Zealand 32.6 bushels, Canada 18.6 bushels, United States 15.0 bushels, Argentine 12.5 bushels, Australia 12.5 bushels, New South Wales 12.7 bushels, and Soviet Russia 11.0 bushels.

An endeavour has been made in this article to show that by growing only on fallowed land the average yield could be raised from about 12 to around about 15 bushels per acre. A further increase could be attained by sounder methods of cultivating the fallow. A material increase is also possible by eliminating some of the unsuitable varieties now grown and substituting high-yielding wheats of proved merit Then there is the factor of better farm management, with crop rotation and live stock farming, all tending towards higher wheat yields. Considering all the cultural improvements outlined, does it not seem possible, and not at all a difficult matter, to raise the New South Wales average wheat yield from 12.7 to 15 bushels per acre (the United States average)? If growers resolved to sow only on fallowed land the objective would be attained by that one effort alone.

FITZROY SEED MAIZE CONTEST AT GRAFTON.

As in previous years, a Fitzroy yield test will be held this season at Grafton Experiment Farm. Growers who intend competing should send along to the manager of the farm mentioned 5 lb. samples of seed. These samples will be grown under uniform conditions, and a certificate will be awarded the owner of the highest-yielding sample. Progressive growers have recognised in these contests a valuable means by which to demonstrate the excellence of their particular strains of Fitzroy, and consequently a demand for seed of those strains.

The Department reserves the right to limit the number of entries and to reject any samples not sufficiently pure or true to type.

Further particulars can be had from the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney, or from the farm manager.

A FURTHER NOTE ON STACK SILAGE AT TUMUT.

CAPTAIN M. J. COLYER's method of converting surplus pasture growth into stack silage, as described in the June issue of the *Agricultural Gazette*, created a good deal of interest among stock owners. Subsequently, Captain Colyer opened up the stack and found the silage of excellent quality, and estimates the total spoilage at not more than 15 per cent. Readers will remember that the estimated tonnage of this stack was 65 tons, the cost running out at about 11s. 4d. per ton.

Wheat Entered for the Royal Agricultural Society's Show, 1931.

RESULTS OF MILLING TESTS.

G. W. NORRIS, Assistant Analyst, Chemist's Branch.

THE Farrer Court was not as well filled as in previous years, the number of entries being 155 as compared with 229 in 1930. Adverse weather conditions during harvesting and a reduction in the number of classes from sixteen to twelve were perhaps the chief contributing causes.

The judging was carried out on lines similar to those of previous years, the wheats in each class being submitted to a very critical preliminary inspection and the obviously inferior samples eliminated. The remaining samples were then milled and points awarded according to the scale shown in the following tables:—

RESULTS of Milling and Flour Testing.

—	Variety.	Appearance of Grain.	Weight per bushel.		Ease of Milling.	Percentage of Flour.	Percentage of Pollard.	Percentage of Bran.	Points.	Colour of Flour.	Dry Gluten		Strength.		Total Points.
			Actual Weight.	Points.							Percentage	Points.	Water Absorption.	Points	
Maximum Points ..		10	—	15	10	—	—	—	10	15	—	20	—	20	100
Cat. No.			lb												
Class 1187 (Champion Weak Flour).															
7051	Waratah	9	66	13	10	74·2	13·2	12·6	9	13	11·4	15½	42·6	7½	77
7052	Petatz Surprise ..	10	68	15	10	73·8	13·1	13·1	8½	12	16·0	20	43·0	8	83½
7053	Waratah	10	67½	14½	10	74·0	13·0	13·0	9	15	11·5	15½	43·6	8½	82½
7056	Ranee	9	64½	11½	10	72·8	15·2	12·0	7½	9	9·5	13½	44·2	9	69½
7059	Ford ...	8	66¼	13	10	73·5	12·0	14·5	8½	12	13·7	17½	41·6	9½	78½
Class 1188 (Commonwealth Champion Prize).															
7060	Yandilla King .	10	66¾	13½	10	74·0	13·0	13·0	9	13	13·1	17	44·2	9	81½
7061	Florence .. .	10	67¾	14½	10	75·1	13·7	11·2	10	14	13·8	17½	44·6	9½	85½
7062	Florence	10	67½	14	10	74·1	14·0	11·9	9	13	14·8	18½	43·6	8½	83
7063	Nabawa ...	10	67½	14	10	74·3	13·0	12·5	9	10	9·3	13	43·6	8½	74½
7065	Canberra	9	65	12	10	74·4	11·3	14·3	9½	13	10·0	14	43·0	8	75½
7066	Florence	10	66½	13½	10	73·8	14·6	11·6	8½	14	13·0	17	44·8	9½	82½
7067	Union . .	9	65½	12½	10	72·8	13·9	13·3	7½	13	9·6	13½	43·8	8½	74
7068	Yandilla King	8	64	11	10	73·8	13·1	13·1	8½	12	10·9	15	44·0	9	73½
7069	Gresley	9	65¼	12½	10	73·7	13·0	13·3	8½	14	10·0	14½	44·0	9	77½
7070	Nabawa	7	61½	8½	10	72·7	12·6	14·7	7½	12	10·2	14	43·8	8½	67½
7071	Ford	8	66¼	13	10	74·0	13·0	13·0	9	12	7·8	11½	42·8	7	70½
7072	Florence	7	65¾	12½	10	73·8	14·1	12·1	8½	15	14·3	18	43·8	8½	79½
7073	Florence	8	66	13	10	74·4	13·9	11·7	9½	14	14·2	18	44·0	9½	82
7074	Canberra	7	64¾	13½	10	73·8	12·2	14·0	8½	15	6·4	10½	42·4	7½	72
7075	Clarendon .	9	66¼	13	10	73·9	12·8	13·3	9	14	10·7	14½	43·6	8½	78
7076	Ford	9	66½	13	10	74·2	14·6	11·2	9	13	12·0	10	43·8	8	72
7077	Gresley	9	66¾	13½	10	72·0	13·5	14·5	7	13	9·0	12	42·0	7	71½
7078	Nabawa	9	64½	11½	10	73·3	14·0	12·6	8	10	9·8	13½	43·6	8½	70½
7079	Nabawa	8	65	12	10	74·0	12·5	13·5	9	9	7·9	12	43·6	8½	68½
7081	Ford . ..	7	64½	11½	10	74·1	14·1	11·8	9	12	7·6	11½	42·8	7½	69
7082	Wangan	8	66½	13½	10	73·0	15·0	12·0	8	14½	11·2	15	46·4	11½	80
7083	Clarendon ...	8	66	13	10	73·3	13·8	12·9	8	12	8·4	12½	43·0	8	71½

RESULTS of Milling and Flour Testing—*continued.*

—	Variety.	Appearance of Grain.	Weight per bushel.		Ease of Milling.	Percentage of Flour.	Percentage of Pollard.	Percentage of Bran.	Points.	Colour of Flour.	Dry Gluten.		Strength		Total Points.
			Actual Weight.	Points.							Percentage.	Points.	Water Absorption	Points.	
	Maximum Points ...	10	—	15	10	—	—	—	10	15	—	20	—	20	100
Cat. No.			lb												
	Class 1188a (Strong Wheat).														
7064	Carrabin	10	67½	14	10	74·6	14·1	11·3	9½	15	12·0	16	48·0	13	87½
7084	Pusa No. 4 ..	10	65¾	12½	9	74·4	14·8	10·8	9½	13	16·3	20	54.0	19	93
7085	Comeback .	10	65¾	12½	9	74·4	12·8	12·8	9½	15	13·5	17½	50.0	15	88½
	Class 1190 (Waratah) [Special].														
7091	Waratah . .	9	66	13	10	74·2	13·2	12·6	9	13	11·4	15½	42·6	7½	77
7092	Waratah ...	10	67½	14½	10	74·0	13·0	13·0	9	15	11·4	15½	43·6	8½	82½
7096	Waratah . .	9	65¾	12½	10	74·5	12·5	13·0	9½	14	10·6	14½	44·0	9	78½
7102	Waratah	8	66¼	13	10	73·8	14·6	11·6	8½	15	8·0	12	43·4	8½	75
	Class 1191 (Nabawa) [Special].														
7105	Nabawa .. .	10	67¼	14	10	74·3	13·2	12·5	9	10	9·3	13	43·6	8½	74½
7108	Nabawa	10	64	11	10	74·6	12·4	13·0	9½	12	11·5	15½	45·8	9½	77½
7111	Nabawa	7	61½	8½	10	72·2	12·6	14·7	7½	12	10·2	14	43·8	8½	67½
7113	Nabawa	9	66¾	13½	10	72·0	13·5	14·5	7	13	8·0	12	42·0	7	71½
	Class 1192 (Novice).														
7115	Yandilla King .	9	66¼	13	10	73·9	12·1	14·0	9	12	11·2	15	44·0	9	77
7116	Waratah .. .	9	66	13	10	74·2	13·1	12·6	9	13	11·4	15½	42·6	7½	77
7117	Yandilla King .	10	66¾	13½	10	74·0	13·0	13·0	9	13	13·1	17	41·2	9	81½
7121	Union ...	9	65	12	10	73·8	14·2	12·0	8½	13	12·7	16	44·4	9½	78
7122	Gresley	9	65½	12½	10	73·7	13·0	13·3	8½	14	10·6	14½	44·0	9	77½
7125	Ranee	9	64½	11½	10	72·8	15·2	12·0	7½	9	9·5	13½	44·2	9	69½
7129	Ford	8	66¼	13	10	74·0	13·0	13·0	9	12	7·8	11½	42·8	7	70½
7130	Clarendon	9	66½	13½	10	73·3	14·2	12·4	8	15	11·3	15	44·4	9½	80
7133	Clarendon .. .	9	66¼	13	10	73·9	12·8	13·3	9	14	10·7	14½	43·6	8½	78
7134	Ford	9	66¼	13	10	74·2	14·2	11·2	9	13	12·0	16	43·0	8	78
7135	Petatz Surprise	9	67¼	14	10	74·3	13·8	11·9	9	13	10·7	14½	43·8	8½	78
7136	Clarendon	8	66	13	10	73·3	13·8	12·9	8	12	8·4	12½	43·0	8	71½
	Class 1193 (Federation).														
7137	.. ..	.	..	..	..	...	...	..	..	.	.	..	2nd.	.	...
7138	....	..	.	..	...	.	..	...	.	..	..	..	1st	..	..
	Class 1194 (Florence or Hard Federation).														
7140	Florence	10	67¾	14½	10	75·1	13·7	11·2	10	14	13·8	17½	44·6	9½	85½
7141	Florence	10	67¼	14	10	74·1	14·0	11·9	9	13	14·8	18½	43·6	8½	83
7143	Florence .	10	66½	13½	10	73·8	14·6	11·6	8½	14	13·0	17	44·8	9½	82½
7144	Florence	10	66½	13½	10	73·8	14·0	12·2	8½	14	13·3	17	44·8	9½	82½
7145	Hard Federation .	10	65	12	10	73·7	13·0	12·8	8½	14	9·6	13½	52·0	17	85
7146	Florence	7	65¾	12½	10	73·8	14·1	12·1	8½	15	14·3	18	43·8	8½	79½
7147	Florence	8	66	13	10	74·4	13·9	11·7	9½	14	14·2	18	44·0	9½	82
	Class 1195 (Weak Flour Class).														
7150	Waratah	9	66	13	10	74·2	13·2	12·6	9	13	11·4	15½	42·6	7½	77
7151	Petatz Surprise ...	10	68	15	10	73·8	13·1	13·1	8½	12	16·0	20	43·0	8	83½
7152	Waratah	10	67½	14½	10	74·0	13·0	13·0	9	15	11·5	15½	43·6	8½	82½
7153	Federation ...	9	64¾	11½	10	74·5	14·8	10·7	9½	14	10·4	14½	44·0	9	77½
7159	Waratah	9	65¾	12½	10	74·5	12·5	13·0	9½	14	10·6	14½	44·0	9	78½
7163	Petatz Surprise ...	9	67¼	14	10	74·3	13·8	11·9	9	13	10·7	14½	43·8	8½	78
	Class 1196 (Medium Strong—Field Wheat Competition).														
7166	Yandilla King ...	9	66¼	13	10	73·9	12·1	14·0	9	12	11·2	15	44·0	9	77
7167	Florence	10	67¾	14½	10	75·1	13·7	11·2	10	14	13·8	17½	44·6	9½	85½
7179	Ranee	9	64½	11½	10	72·8	15·2	12·0	7½	9	9·5	13½	44·2	9	69½
7183	Ford	8	66¼	13	10	74·0	13·0	13·0	9	12	7·8	11½	42·8	7	70½
7187	Ford	10	66	13	10	73·0	14·0	13·0	8	13	10·6	14½	43·0	8	76½
	Class 1197 (Weak Flour—Field Wheat Competition).														
7195	Waratah	10	67½	14½	10	74·0	13·0	13·0	9	15	11·5	15½	43·6	8½	82½
7203	Waratah	9	65	12	10	74·6	13·1	12·3	9½	14	12·7	16½	43·0	8	79

Mr. C. H. Crago, of Messrs. F. Crago and Co. Ltd., Newtown, represented the Flour Mill Owners' Association, and ably assisted in the judging of Class 1187. In his laboratory at the Newtown mill Mr. Crago also examined the flour of the wheats milled in this class. My thanks are also due to Mr. R. M. Petrie, Chemist's Branch, for assistance rendered in the milling of the samples.

Comments.

The wheat classes this year were remarkable for two features; firstly, for a record score of points awarded to a strong white sample, and secondly, the outstanding success of Mr. J. W. Eade, of Euchareena. This competitor won the State championship with the variety Petatz Surprise, which produced a flour very rich in gluten, yielding 16 per cent. With the variety Florence he secured second prize in the Commonwealth championship, scoring a total of 83 points, or 2½ points behind the winner.

The Commonwealth championship class attracted twenty-four entries, and competition was keen. The first prize and cup were won by Messrs. Cole Bros. and Kerr, of Duri, with a fine sample of Florence, weighing 67¾ lb. per bushel, and which scored a total of 85½ points.

In the Strong White Class, an excellent sample of Pusa exhibited by Mr. J. N. Barrett secured first place with a record score of 93 points. The flour was, as is usual with this variety, very rich in gluten, and recorded a high figure (54) for water-absorption. The sample of Comeback, which took second prize, was not up to its usual standard, and had only a point to spare, scoring 88½, while the next best was 87½ points.

A very fine sample of Carabin exhibited by Mr. J. M. Forrester, of Western Australia, is worthy of mention. It scored 87¼ points in the Strong White Class, and was easily the third strongest wheat exhibited this year.

The Waratah Special Class attracted a large entry, the first prize going to Mr. J. W. Eade, with a total of 82½ points. The colour of the flour was outstanding, for which it scored the maximum 15 points.

The Nabawa Special also had a large entry, but the weather had a marked effect on the appearance and weight per bushel of this variety. Some samples weighed as light as 61 lb., while quite a number were around 63 lb. per bushel.

The special class for Florence or Hard Federation was a fine display and contained some very heavy samples, weighing between 66 to almost 68 lb. per bushel.

The Weak Flour Class (field wheat competitors) attracted a large entry, but contained only a few good samples, and here again the weather helped the judge in the preliminary examination, after which only a few samples remained to be milled.

Fodder Conservation Competitions, 1931.

REPORT OF THE COASTAL DISTRICTS CHAMPIONSHIP.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

THE Championship Fodder Conservation Competition recently conducted in the coastal districts was the most successful that has so far been held in the State, not only in point of the number of entries, but also as regards the general enthusiasm and intelligent interest displayed.

The response of the South Coast agricultural societies was most encouraging, district competitions being organised by thirteen societies, which eclipsed by one the record of the previous year, and, moreover, there was an improvement in the average number of entries in the local competitions. The Dorrigo Agricultural Society was again the only society on the North Coast which conducted a competition, and for the purpose of the championship it was necessary to combine this entry with the South Coast division. The societies represented were:—Albion Park, Bega, Berrima District, Berry, Bodalla, Camden, Cobargo, Dapto, Dorrigo, Kangaroo Valley, Kiama, Pambula and Shoalhaven (Nowra) Agricultural Societies and Tilba Tilba Agricultural Bureau.

The South Coast dairy-farmers are setting an excellent example to those in other dairying districts in conserving fodder for the feeding of their dairy herds during periods of shortage. In the present difficult time it is all the more imperative to keep down the cost of production, and the safest and most certain way of reducing production costs is to increase the production per cow by better feeding with fodders grown on the farm. During the summer prolific growth is made as a rule, and crops such as maize produce high yields of fodder, but as winter advances pastures become sparse, and as a result milk production decreases at a period when the dairy products are usually at their highest price. That this falling off in returns can be prevented is amply demonstrated by the competitors in this competition, who, by conserving fodder, ensure that their herds are maintained at full production during the lean periods.

The conditions and scale of points for judging the competitions in coastal districts are as follows:—

Fodders Eligible for Conservation to be—Concentrates (including all grains), or roughage—as hay (*e.g.*, lucerne, oaten, wheaten, clover, grass), silage, and any other fodder suitable for conservation, to have been produced on the land owned, leased or held on shares by the competitor. No farmer or grazier whose holding consists of less than thirty (30) acres will be eligible to compete.

SCALE OF POINTS FOR JUDGING—COASTAL AREAS.

		Points.
1. *Suitability and Quality of Fodder*		65
(*a*) Judged according to the suitability of fodder or combination of fodders for the purposes for which they are required	30	
(*b*) Judged as to appearance, apparent palatability, and nutritive and feeding values	35	

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* Mr. Stening judged this championship competition.

Scale of Points for Judging—Coastal Areas—*continued.*		Points.
2. *Location and Protection*		40
(*a*) Locality—Location of the site, having regard to fire, flood, economy in feeding, and general access	20	
(*b*) Protection—Protection from weather, pests, stock, fire, and general deterioration	20	
3. *Economy of Production* ... ... Including land value, production, storage, and feeding costs.		25
4. *Carrying Capacity* ... ... Quantity for the requirements of competitor's holding to be based on the carrying capacity of the holding (when improved and under natural pasture). The maximum amount considered to be competitor's requirements per cow to be 20 cwt. lucerne hay or its equivalent in feeding value (1 cwt. lucerne hay = 1½ cwt. cereal hay = 3 cwt silage = ½ cwt. grain).		60
5. *Quantity of Fodder in Excess of requirements* ... ... At the rate of 5 points for surplus fodder equal to the quantity required for the holding.		10
Total		200

Judging was commenced at Pambula on 15th June, and was completed at Dorrigo on 25th June.

Table of Awards—South Coast and North Coast Divisions.

Society.	Competitor.	Suitability.	Quality.	Location	Protection	Economy of Production.	Carrying Capacity.	Surplus.	Total.
Maximum points		30	35	20	20	25	60	10	200
1. Bodalla ...	H. Jeff Bate, "Durham Farm," Bodalla.	29	33	19	19	22	60	4	186
2. Berry ...	J. R. Shepherd, "Riverview," Bomaderry.	26	33	18	19	23	60	...	179
3. Bega ...	O. Guthrey, "Elmgrove," Bega.	28	31	17	18	21	60	3	178
4. Tilba Tilba ...	H. J. Bate, "Mountain View," Tilba Tilba.	25	32	18	18	23	60	...	176
5. Berrima District.	A. C. Brown and Sons, "Collingwood," Exeter.	23	28	18	18	23	60	6	176
6. Camden ...	W. Nippard, "Glenburnie," Elderslie.	24	31	19	16	21	60	4	175
7. Dorrigo ...	W. S. Rogan, "Booroola," North Dorrigo.	25	31	16	17	22	60	3	174
8. Kangaroo Valley.	H. O. Cox, "Melrose," Kangaroo Valley.	28	27	17	18	21	60	2	173
9. Cobargo ...	R. E. Salway, "Narira," Cobargo.	24	28	18	18	23	60	...	171
10. Pambula ...	L. S. Perry, "Homeward," Millingandi.	25	30	17	18	20	60	...	170
11. Dapto ...	H. A. Green, "Woodville," Yallah.	25	28	16	18	22	60	...	169
12. Albion Park ..	A. A. Gorrell, "Glenview," Yallah.	24	27	18	17	22	60	1	169
13. Shoalhaven (Nowra).	A. Mottram, "Prairie Vale," Numba.	25	30	16	18	20	59	...	168
14. Kiama ...	G. Grey, "Greyleigh," Kiama.	22	31	18	19	23	51	...	164

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G. D. ROSS, Under Secretary, Box 36A, G.P.O., SYDNEY.

Mr. H. Jeff Bate repeated his success of the previous year by again winning the championship. He had a good margin of seven points as the result of the all-round excellence of his methods of conserving fodder. The quantity, quality and combination of the fodders were of a very high standard, and the protection and general lay-out of the fodders for convenience of feeding were ideal. His property of 428 acres, of which 140 acres is scrub, was estimated to carry seventy-six cattle when under unimproved pasture. The fodders consisted of 154 tons of maize silage conserved in two reinforced concrete silos, well roofed and adjoining the feeding stalls; 45 tons of lucerne hay, well protected in a hay shed, and 21 tons of maize grain stored in two cribs, which were erected on piles 3 feet from the ground, and which were capped with galvanised iron plates to keep out mice and rats. The total quantity was considerably in excess of the requirements for the feeding period.

Mr. J. R. Shepherd, of Berry, who won the second prize, is setting a very fine example to the dairy-farmers of Illawarra, particularly in his adoption of progressive methods in providing feed for his dairy herd by fodder conservation and pasture management. The total area of his property is 394 acres, the carrying capacity of which was estimated to be eighty head. The conserved fodders included 162 tons of maize silage in twin concrete overhead silos, 34 tons of paspalum grass silage in two stacks, 19 tons of lucerne hay, and 7 tons of maize grain in sheds, providing in all a little more than sufficient for requirements. The quality throughout was excellent, but the proportion of lucerne hay was too low to permit the feeding of a satisfactory balanced ration.

Mr. O. Guthrey succeeded in winning the third prize, and thus improved the position occupied in previous competitions. His property of 636 acres, of which 100 acres were rich river flats, was estimated to carry 132 head of cattle when under natural pasture. Two reinforced concrete silos, which adjoined the feeding stalls, contained 154 tons of maize silage; a large shed was full of lucerne hay, and a small quantity was stacked in the open, totalling in all 109 tons, and 23 tons of maize stored under cover. The whole of the fodder was computed to be sufficient for feeding 207 head, and thus greatly exceeded the requirements for the stipulated feeding period.

General Comments.

All competitors with the exception of two relied on maize silage as the foundation of their conserved fodders. Silage is ideal for forming the bulk portion of the ration, and maize is the most economical crop for the purpose, as it cannot be excelled in the production of total nutrients per acre.

Four competitors used the trench method for the conservation of silage, and the others conserved their silage in tower silos constructed of concrete, brick or plain galvanised iron. In addition, grass silage was made in stacks by two competitors. In each case there was at least 1 foot of the silage around the sides of the stacks spoiled by mould and drying out, due to exposure of the external surfaces to the air. In one instance the proportion of waste was 24 per cent. of the total quantity of silage in the stacks, the cash value of which greatly exceeded the cost of excavating a pit to hold the whole of the silage with comparatively little waste, and the pit would be available for years. The stack method of making silage may appeal to some farmers, because it is the least expensive system, but owing to the excessive waste it is the least economical. The cost of excavating a trench silo is very reasonable, amounting to approximately 3s. per ton capacity. Some competitors have gone to the trouble to excavate the batters with pick and shovel, which is quite unnecessary, for, although the capacity of the pit is increased, it is effected at too great a cost for the pick and shovel work as compared with the plough and scoop. Moreover, it is an advantage to leave batters of about three to one at the ends, as they facilitate the operations of filling the pit and removing of the silage. Drawing the loads over the fodder during filling operations materially assists in packing the fodder.

For those who can afford it, the tower silo of reinforced concrete is undoubtedly the best by reason of its permanence, convenience and efficiency. In a few cases the amount of waste on the top of the silage was greater than is necessary, due evidently to insufficient tramping to exclude the air from the top layers. The spoiling of a certain quantity is inevitable, but by good management it should not exceed 6 inches. To prevent loss different methods of applying pressure and excluding air from the surface silage were adopted, for instance, by using bark, iron or bags, weighted with kerosene tins filled with earth, or by a uniform covering of about 6 inches of sand, but it is doubtful if the cost of elevating the weighting material does not exceed the value of the silage saved. The loss due to spoilage can be reduced to a minimum by removing the cobs from the fodder which is last filled into the silo, and by applying water and tramping well on alternate days for at least a week after the silo is filled. Loss is experienced sometimes by the draining away of the juices expressed from the silage, and as this liquid is rich in nutrients it is interesting to note how one competitor prevented this loss by placing hay or straw at the bottom of the silo to absorb the expressed juices.

One of the encouraging results of the fodder conservation competitions is the increased attention which is now given to the conservation of lucerne hay for combining with maize silage for the purpose of supplying a balanced ration. There is no better crop than lucerne for supplying quality to the ration, and the fact that all but four competitors included lucerne hay in their fodder reserves indicates that progress is being made in imparting to farmers a knowledge of what constitutes economical feeding.

DRENCHING SHEEP FOR WORMS.

IN discussing the relative costs of the different drenches for worms in sheep (*Agricultural Gazette* for July, page 507) reference was made to "carbon tetrachloride in 10 c.c. doses," whereas it should have read "carbon tetrachloride (1 part to 4 parts liquid paraffin) in doses of 10 c.c."

Field Maize Championships, 1930-31.

L. S. HARRISON, Special Agricultural Instructor.

THE 1930-31 field maize championships were keenly contested, and the number of societies concerned, as well as the number of individual entries, showed a marked increase over the previous year.

For the purpose of the competition the State was again divided into five sections, namely, North Coast, Central Coast, New England and Inverell, Tumut and Gundagai, and South Coast, and although the number of societies originally entering the competitions in each section was satisfactory, in some instances, particularly on the North Coast, the number that remained in to compete for the R.A.S. prizes could not be said to be fully representative.

The North Coast Championship.

The North Coast suffered somewhat this season through unusually late dry conditions. When rain did fall it proved excessive for the crop, in some cases causing a faulty filling of the cob, and, in others, prolonging the ripening until rather late in the year.

NORTH Coast Maize Championship Results.

Competitor and Variety.	Cleanness of cultivation. (Max., 20 points.)	Germination or stand. (Max., 10 points.)	General appearance, condition, evenness, &c. (Max., 10 points.)	Freedom from pests and diseases. (Max., 10 points.)	Purity and Trueness to type. (Max., 15 points.)	Estimated yield. (3 points per 10 bus.)	Total.
J. T. Pratt, Kyogle (Fitzroy) ...	19	8	9	8	11	30	85
Messrs. Cleaver and Sons, Bellingen (Large Yellow Horsetooth) ...	18½	8½	9	8	10½	27	81½
W. A. Smith, Dorrigo (Narrow Red Hogan type)	19	8½	8½	8½	9	27	80½
J. G. Payne, Casino (Large Yellow Horsetooth)	18	8½	9	8½	10½	25½	80

The above table directs attention to the necessity of giving more consideration to purity and trueness to type. These are essential factors in the production of consistently high-yielding crops. The varieties used, apart from Mr. Pratt's Fitzroy, were not particularly desirable. Large Yellow Horsetooth, whilst a fair yielder under suitable conditions, cannot compare with Fitzroy either in regard to yield or disease resistance under North Coast conditions. The Dorrigo, of course, requires a quicker maturing variety than Fitzroy, although the question of seed purity is of equal importance.

The winning crop was located on a particularly friable alluvial flat that had been under lucerne for many years, the lucerne being ploughed out in

1929. Previous cropping with a leguminous crop always promises a good maize yield, and maize growers should therefore aim at growing a leguminous crop in rotation with maize. Cowpeas are suitable for summer and field peas or vetches for winter cropping. These crops could be grown either for the definite purpose of renovating the soil, or partly for that purpose and partly as a grazing proposition. In the case of lucerne it will be found a profitable practice to establish a stand on old maize land and allow the lucerne to occupy the land for four or five years and then return to maize for a period.

Mr. Pratt grew the winning crop on land that had been under cultivation for eighteen years, this being the second maize crop since the plot was under lucerne. The competition plot was ploughed early in September, then cultivated, harrowed and rolled, ploughed again in November, harrowed twice, re-ploughed in December and again harrowed. Planting took place in mid-December in rows 4 feet apart with three grains every 22 inches. After the crop was up it was cultivated twice and disc hilled.

Messrs. Cleaver and Sons planted towards the end of October in rows 4½ feet apart with two or three grains every 3 feet. The land had been under pasture until 1929, and was ploughed for the maize crop in July, 1930, and then disc cultivated, re-ploughed in October, and harrowed twice.

Mr. W. A. Smith ploughed early in October, his land having been broken up three years previously and sown to oats in 1929. Planting took place at the end of October in rows 3 feet apart with two or three grains every 20 inches. This crop, as will be noted, was planted very thickly, and after sowing was scuffled twice, and then Italian Rye grass was sown between the rows in mid-February. The season favoured this crop, and the estimated yield of 90 bushels was a good one.

The Central Coast Championship.

The early part of the season in this district was too dry for best results, but was somewhat compensated for by the favourable conditions experienced during the latter half of the season.

The results of the championship are given in the following table:—

CENTRAL Coast Maize Championship Results.

Competitor and Variety	Cleanness of cultivation (Max., 20 points.)	Germination or stand. (Max., 10 points.)	General appearance, condition, evenness, &c (Max., 10 points.)	Freedom from pests and diseases (Max., 10 points.)	Purity and trueness to type. (Max., 15 points.)	Estimated yield. (3 points per 10 bus.)	Total.
A. C. McLeod, Taree, Manning River (Giant White)	20	10	9½	8	11½	31½	90½
E. H. Ducat, Temagog, Macleay River (Fitzroy)	18½	9	9	7½	11	34½	89½
A. Gow, Cornwallis, Hawkesbury River (Yellow Hogan)	18	8	8½	7½	11	27	80

The dry period early in the season helped to emphasise the advisability of early ploughing. Mr. McLeod followed this practice by ploughing in February, and followed it up with many workings. This put his soil in the very best condition to absorb and retain any rain that fell, and was most likely responsible for his success. Mr. E. H. Ducat ploughed in June, early ploughing not being such an important factor in the case of this competitor, whose location always ensures an ample supply of moisture early in the season. Mr. A. Gow ploughed in July, and when dry early summers are experienced this practice is likely to prove too late to permit of a sufficient supply of moisture being stored in the soil. However, the crops generally were exceptionally good this season, as will be gathered from the points awarded. Type and purity, on the whole, were reasonably good, although in the winner's case, while the type was good, a certain amount of inter-pollination had taken place. In Mr. Ducat's case the type was also good, but restricted areas and the growing of a number of varieties make the problem of maintenance of purity a more difficult one.

The maize crops in this section of the State are usually of a fairly high standard, principally due to the employment of advanced cultural methods allied with high soil fertility. The three competitors in this section all used fertiliser on their crops, thus evidencing a determination to give the crops every chance.

Mr. McLeod, the winner, planted his crop towards the end of September on old cultivation land that had been growing maize continuously for many years. The first ploughing was given in February, and six further ploughings were given before planting. The seed was sown in rows 3½ feet apart with two or three grains every 20 inches. Superphosphate (1½ cwt. per acre) was used and the crop scarified four times.

Mr. Ducat sowed his Fitzroy on old cultivation land that had also grown maize continuously for years. He ploughed in June, then harrowed, cultivated, rolled, re-ploughed in September, harrowed and rolled. Planting took place towards the end of September in rows 3¾ feet apart with two or three grains every 32 inches. After-cultivation consisted of three cultivations, after which the crop was plough-hilled and then scuffled. Superphosphate was applied at the rate of 2 cwt. per acre.

Mr. Gow also used old cultivation land, this being the fourth maize crop following lucerne. The land was ploughed in July, and later rolled and harrowed, re-ploughed, rolled and harrowed, re-ploughed, harrowed and rolled. Planting took place in mid-November in rows 4¾ feet apart with one or two grains every 18 inches, and 2 cwt. superphosphate to the acre. After planting it was rolled, scuffled twice, plough-hilled, and again scuffled.

Each of the varieties used undoubtedly has a place in the districts represented.

The South Coast Championship.

The high standard of the crops and the good yields were outstanding features in this competition. Furthermore, all competitors entered only highly desirable standard varieties.

The results are given in the following table:—

South Coast Maize Championship Results.

Competitor and Variety.	Cleanness of cultivation. (Max., 20 points.)	Germination or stand. (Max., 10 points.)	General appearance, condition, evenness, &c (Max., 10 points.)	Freedom from pests and diseases. (Max., 10 points.)	Purity and trueness to type. (Max., 15 points.)	Estimated yield. (3 points per 10 bus.)	Total.
J. M. Lamond, Terara, Nowra (Hickory King)	19	9	9	8	12½	42	99½
James Graham, Barrengarry, Kangaroo Valley (Hickory King) ...	19	9	8	7½	10	37½	91
H. Jeff. Bate, Durham Farm, Bodalla (Funk's Yellow Dent)	18½	9½	9½	7½	11	34½	90½
R. J. Goward, Bamnia, Kiah (Funk's Yellow Dent)	17½	9	9	8½	10	34½	88½
C. Parbery and Sons, Warragaburra, Bega (Funk's Yellow Dent) ...	17½	9½	9	7	10½	34½	88
Colley Bros., Jamberoo (Large Red Hogan)	16	8	8	7½	10½	34½	84½
J. Bruchhauser, Camden (Fitzroy) ...	20	8	8	7	11½	27	81½
W. Cole, The Grange, Pambula (Hickory King)	17½	9	8½	9	9½	27	80½
R. B. Heffernan, Glendalough, Moruya (Funk's Yellow Dent)	18½	9	9	8	12	22½	79
J. L. Cody, Caroon, Cobargo (Boone County White)	18	9	9	10	9	22½	77½
E. H. Filmer, Springvale, Candelo (Hickory King)	19	8½	8½	9	11½	16½	73

Mr. Lamond planted his Hickory King on land that had been under cultivation for six years. First ploughing was given in September, following a crop of garden peas and sorghum, the crop prior to that being summer green feed. After ploughing the land was harrowed, rolled, disc cultivated, harrowed and rolled again, and the crop planted in mid-October, the seed being dropped by hand in ploughed drills 3 feet apart and two grains every 15 inches. The seed was covered by plough. A mixture of equal parts of superphosphate and bonedust (1 cwt. per acre) was used. After planting the land was harrowed and scuffled twice. Although this crop was sown thickly, it was suited by the soil fertility and favourable season.

Mr. Graham ploughed in August, the land having been broken up three years ago. Maize was the previous crop. After ploughing it was disc-cultivated five times, harrowed six times and rolled. The seed was hand-dropped in rows 3½ feet apart and single grains every 9 inches towards the end of October. After-cultivation consisted of two scufflings. Superphosphate and lime (2 cwt. per acre of each) was broadcasted when ploughing in August. Although it is not desirable to broadcast the fertiliser so long before planting, the practice if carried out at the time of the last working about two or three weeks before planting has much to recommend it.

Mr. Bate planted his maize on land that had been cultivated for forty years, this being the second crop of maize following pasture, which had been laid down twenty-five years previously. First ploughing was given in July, after which the paddock was disc-cultivated, harrowed three times and rolled, then thirty drayloads of farm manure per acre were spread. The seed was dropped in rows 3½ feet apart and three or four grains every 28 inches in mid-October. Superphosphate (2cwt. per acre) was used. The crop was harrowed and cultivated five times.

In these first three crops the close attention to details of cultivation, &c., is worthy of imitation by all growers.

A Crop of Funk's Yellow Dent on the South Coast.

The New England and Inverell Championship.

The results in this section were as follows:—

NEW ENGLAND and Inverell Maize Championship Results.

Competitor and Variety.	Cleanness of cultivation (Max., 20 points.)	Germination or stand (Max., 10 points.)	General appearance, condition, evenness &c (Max., 10 points.)	Freedom from pests and diseases (Max., 10 points.)	Purity and trueness to type. (Max., 15 points.)	Estimated yield. (3 points per 5 bus.)	Total.
J. Pedlow, Stonehenge, Glen Innes (Wellingrove)	18½	8½	8½	8	12	36	91½
Gostwyck Estate, Uralla (Early Morn)	17	8½	9	7	11	36	88½
G. B. Koch, Steinbrook, Tenterfield (Hickory King)	17	7½	8½	8	10½	33	84½
A. McLean, Kelly's Plains, Armidale (Large Goldmine)	17½	6½	8½	8½	9½	33	83½

Mr. Pedlow, who has paid very close attention to the improvement in type and uniformity of his Wellingrove maize, used land that had been under cultivation for twenty years, the two previous crops being oats. His first ploughing this season was given in May, after which it was cultivated twice and harrowed twice, the seed being sown in mid-October on the square with three or four grains every 3 feet 10 inches. Five cultivations were given after planting.

The Early Morn used by the Gostwyck Estate was planted on 20th October on the square with two or three grains every 4 feet, after which it was scuffled four times. This land had been under cultivation for ten years, mostly cropped to maize. The first ploughing was given in June, after which it was harrowed several times, re-ploughed and cultivated. Superphosphate (50 lb. per acre) was used on the competition plot.

A Tumut Entry.

Mr. Koch used land that had been under cultivation for four years, the previous crop being maize. First ploughing for the crop was given in September, the land being subsequently harrowed, cultivated and again harrowed. The crop was planted in mid-October in rows 3½ feet apart and one or two grains every 15 inches. It was harrowed and scuffled three times.

Certain varieties stand out as being eminently suitable for various portions of the New England district, for instance, Wellingrove for Glen Innes, Early Morn and Large Goldmine for Uralla, Hickory King and Wellingrove for Tenterfield, and Wellingrove and Large Goldmine for Armidale. These recommendations are supported by the results of the competition.

Early ploughing in all areas is essential for best returns. It allows the soil to benefit by the mellowing effect of the winter, and also puts it in a condition to absorb and retain moisture. No amount of cultivation later in the season can compensate for neglect in this respect.

The Tumut and Gundagai Championship.

Only two societies promoted competitions in this division, and consequently there were only two finalists in the championship, the results of which are as follows:—

TUMUT and Gundagai Championship Results.

Competitor and Variety.	Cleanness of cultivation. (Max., 20 points.)	Germination or stand. (Max., 10 points.)	General appearance, condition, evenness, &c. (Max., 10 points.)	Freedom from pests and diseases. (Max., 10 points.)	Purity and trueness to type. (Max., 15 points.)	Estimated yield. (3 points per 5 bus.)	Total
T. Hainsworth, Gundagai (Murrumbidgee White)	18½	7½	7½	7½	11½	42	94½
Butler Bros., Tumut (Early Clarence)	18½	7½	9	7	12	39	93

A Typical New England Crop.

Floods interfered with the time of initial ploughing and sowing in the Tumut and Gundagai districts, with the result that both the above crops were planted later than is desirable.

Mr. Hainsworth's land had been broken up about twelve years ago and has grown maize continuously. It was ploughed in August and then harhowed and rolled. After being flooded early in October it was disc-cultivated and harrowed, and planted in mid-November in rows 4 feet apart with two or three grains every 2 feet 3 inches. After planting it was harrowed twice and scarified twice.

Messrs. Butler Brothers planted towards the end of November in rows 3¾ feet apart with two or three grains every 32 inches. This is very old cultivation land and has been under maize for a long period. It was ploughed in September, harrowed, rolled, re-ploughed mid-November, rolled and harrowed twice. After planting it was harrowed and scarified twice.

Murrumbidgee White was the variety most used this season on the Tumut River, for which locality it has proved very suitable. Early Clarence also has proved a good yielder in this district. Another variety of distinct merit is Funk's Yellow Dent, which is particularly suitable for the Gundagai district.

In concluding this report an appeal is made to growers to take special precautionary measures for the control of what are termed the "root, stalk and cob rot" diseases of maize. Evidence of these fungous diseases has been noted in the maize-growing areas throughout the State. Growers have had the control measures described in detail repeatedly, and are again reminded that the closest attention to them are necessary at all times.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows: these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1931.

West Wyalong (A Andrew) ...	Sept.	1, 2
Murrumburrah (W. Worner) ...	,,	1, 2
Parkes (L. S Seaborn)	,,	1, 2
Deniliquin (P. Fagan)	,,	2
Burrowa (S G Hughston) ...	,,	3, 4
Corowa (H. G. Norton)	,,	4, 5
Barmedman (S S Penberthy) ...	,,	5
Young (Thos A Tester) ...	,,	8, 9
Forbes (E A. Austen)	,,	8, 9
Cowra (E P. Todhunter) ...	,,	15, 16
Temora (J M McInnes) ...	,,	15, 16
Ganmain (W H Logan) ...	,,	15, 16
Junee (G W Scrivener) ...	,,	22, 23
Canowindra (W E. Frost) ...	,,	22, 23
Barellan (W H McRae) ...	,,	23
Singleton (J T McMahon) ...	Sept.	23, 24, 25
Cardiff Agricultural Bureau ...	,,	25
Ardlethan (Les Smith)	,,	30
Berrigan (R Wardrop)	,,	30
Hay (G. C. McCracken)	,,	30, Oct. 1
Canberra (C. R. E. Southwell) ...	Oct.	2, 3
Narrandera (J. D. Newth) ...	,,	6, 7
Ariah Park (Mort Collings) ...	,,	7
Quandialla (Stuart Tompkins) ...	,,	7
Walbundrie (H. G Collins) ...	,,	7
Griffith (M. E. Sellin)	,,	13, 14
Bribbaree (J. Aston)	,,	14
Carcoar (T. G. Stammers) ...	,,	14
Cootamundra (G B Black) ...	,,	20, 21
Millthorpe (H. P Smith) ...	,,	20, 21

1932.

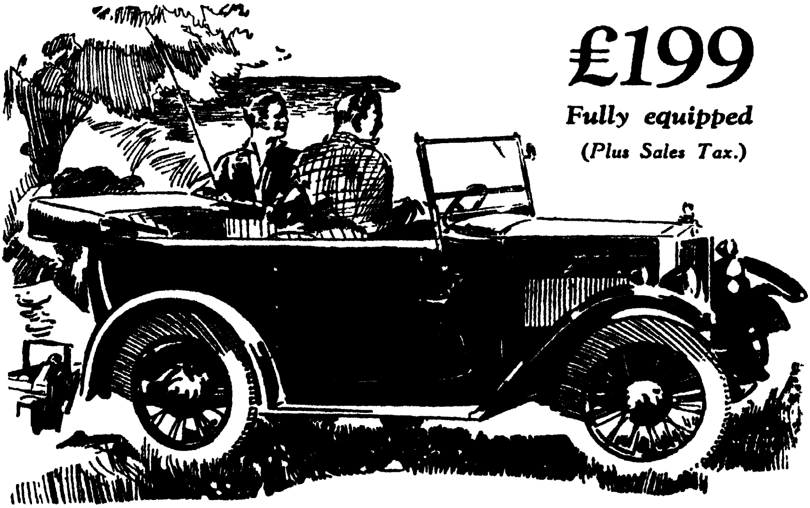
Tumut (Milton Archer)	Mar.	1, 2

INFECTIOUS DISEASES REPORTED IN JULY.

THE following outbreaks of the more important infectious diseases were reported during the month of July, 1931:—

Anthrax	Nil.
Blackleg	10
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	15
Swine fever	Nil.
Contagious pneumonia	Nil.
Necrotic enteritis	1

—MAX HENRY, Chief Veterinary Surgeon.



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Yanco Rice Growing Competition, 1930-31.

THE METHODS THAT BRING SUCCESS.

H. J. DARGIN, Agricultural Instructor.

THE sixth annual rice-growing competition held under the auspices of the Yanco Irrigation Area Agricultural Society for the cup donated by the Rice Millers' Association attracted fifteen entries, one of which (that of Mr. N. S. Ellis, of South Gogeldrie) was withdrawn prior to judging on account of hail damage.

Although the entries were fewer than last year, both competing and non-competing growers displayed keen interest in the methods employed by the successful entrants. This, perhaps, is only natural. The cost of producing rice is high and prices have fallen so much in recent years that growers have been made to realise that they cannot afford to leave unexplored any avenue of knowledge that is likely to enable them to grow their crops to better advantage.

Harvesting the Winning Crop.

A thorough and sufficiently early preparation of their rice fields is essential, while sowing on the different clay loams should be undertaken as early as the season and the type of soil will allow. This will help in the effective control of weeds and enable harvesting operations to be commenced earlier.

The Season.

The weather conditions experienced during the growing period were most unfavourable. Rain fell during September and October, which, although enabling some settlers to obtain a satisfactory germination without irrigating for this purpose, caused considerable delay in the preparation of the land and sowing in some localities, more particularly on the grey soils and those of heavy texture. In October cool weather prevailed, with two frosts as late as the 22nd and 23rd of the month, followed by hot windstorms in November. Cool weather was experienced throughout December, and very little hot weather was experienced during the summer months. Autumn rain set in early; the 298 points in March established a record for the Leeton observatory, a further 179 points fell during April and 451 points in May.

This year's crop matured considerably later than usual, and in many of the late October and November-sown fields, the late-maturing grains did not colour up or lose their green appearance as quickly as is desired, owing to the continuous wet weather and absence of frosts. This condition of the grain was most noticeable on the dark soils (grey and blue clay loams), and soils of uneven texture, such as crab-holey, and puff country.

The Winning Crops.

Mr. R. St. Chad Young's winning crop, grown on Farm No. 1684, South Yanco, on a heavy red loam, sown between the 9th and 14th October, and estimated to yield 200 bushels per acre, was a particularly dense and uniform crop. While losing a number of points for condition, it scored well for evenness and appearance, effective methods of weed control, preparation of the land, irrigation control and drainage. This crop was exceptionally clean; the check banks were big and strong and held water on the crop to a depth of 10 to 15 inches.

The crop placed second, grown by Mr. W. F. Maskus, on Farm No. 1705, South Gogeldrie, on a stiff, red loam and grey clay loam, was estimated to yield 190 bushels per acre. The preparation of the land, water control and drainage were good; a trace of barnyard grass and cumbungi was noticeable in several bays, but there was practically no weed growth on the check banks, owing to the land having been sown with rice prior to constructing the banks. The red loam (10 acres) was sown during the second week in September, and watered on 15th September, while the 15 acres of grey clay loam were sown at the end of September and watered on 7th October.

The crop placed third was grown by Mr. R. D. MacKellar, on Farm No 1722, Murrami, the soil being principally grey clay loam with a little red loam (puff country). The preparation of the land, and irrigation control and drainage were excellent, while the crop scored well for condition. Several points were lost under the heading of appearance and evenness, but this was due to the texture of the soil. The whole of Mr. MacKellar's rice, and Mr. Young's No. 1 entry, were the cleanest crops inspected throughout both the bays and check banking system. Many settlers can well afford to take advantage of Mr. MacKellar's experience as a rice grower by adopting similar cultural methods.

AWARDS in Yanco Rice Growing Competition, 1930–31.

Competitor.	Preparation of land, including seed bed, facilities for irrigation control and drainage. (Max., 50 points.)	Freedom from weeds. (Max., 1st crop, 2 points; 2nd crop, 25 points; 3rd and subsequent crops, 30 points.)	Condition, appearance and evenness of crop. (Max., 25 points.)	Apparent yield. (One point for each bushel of apparent yield.)	Suitability of rotation for second and subsequent crops. (Max., 2nd crop, 5 points; 3rd crop, 10 points; subsequent crops, 15 points.)	Effective methods of weed control. (Max., 10 points.)	Exhibiting sheaf at Show. Max., 10 points.)	Total points.
R. St. Chad Young, Farm 1684, South Yanco. (Entry No. 2.)	46	18	17	200	...	8	10	299
W. F. Maskus, Farm 170 , South Gogeldrie.	45	17	17	190	...	8	10	287
A. D. MacKellar, Farm 1722, Murrami. (Entry No. 2.)	46	19	19	180	...	8	10	282
R. St. Chad Young, Farm 1684, South Yanco. (Entry No. 1.)	46	19	21	175	...	8	10	279
F. R. King, Farm 387, Leeton ...	43	16	21	170	...	6	10	266
K. B. Rogers-Harrison, Farm 1132, Calorofield.	44	21	18	160	4	7	10	264
W. Playford and W. S. Smith, Farm 1702, South Gogeldrie.	40	18	17	170	...	7	10	262
A. D. MacKellar, Farm 1722, Murrami. (Entry No. 1.)	48	19	21	150	...	7	10	255
A. T. Edwards, Farm 367, Leeton	45	17	17	150	...	7	10	246
O. Bauermeister, Farm 204, Leeton	43	16	18	160	...	7	Nil.	244
J. T. Gladman & Sons, Farm 202, Wamoon.	41	18	16	150	...	7	10	242
W. S. Martin, Farm 1003, Gogeldrie.	40	16	18	150	...	6	10	240
W. H. and G. T. Nolan, Farm 1706, South Gogeldrie.	40	16	17	145	...	6	10	234
Chapman Bros., Farm 166, Stoney Point.	42	17	18	140	...	7	10	234

General Comment.

The actual yields of the crops judged compared very favourably with those of last year, when the estimated average yield was 3 tons per acre, the average yield for the competition this year being a few bushels per acre greater. This is no doubt due to the fact that a little more than half as many entries were inspected this year.

The best crops were again found to be on the properties of farmers who prepared their land well. Where sufficient grading, large check banks, and ditches which allowed deep submersion early in the season and even water control throughout the growing period were adopted, the weed control was infinitely better, the rice matured more evenly, and heavier yielding crops resulted. The winning entry was grown in 10 to 15 inches of water, the crop placed second in 9 inches to 1 foot, and the third placed entry grew in water 10 to 15 inches deep, while many of the other heavy-yielding entries were also grown in water not less than 8 inches deep.

Weed Control.

The days when payable crops can be produced with slip-shod methods on new land have almost passed. During the 1930-31 season 65 per cent. of the rice crops were grown on virgin soil, but for the 1931-32 season, 65 per cent. of the land will have grown rice previously, which means that the growers will be up against an even greater weed growth problem than has even been the case before.

Several of the competitors who erected check banks, etc., during September and October adopted the recommendation of the Department and sowed the strips of land over which the check banks were to be constructed prior to erecting them, with excellent results. Not only were these banks strengthened by the rice root system, but they were practically free from weed growth, and in those cases where the banks were big and strong enough to hold water to within a few inches of the top, the rice matured and could be harvested. This method of weed control is well worth considering, as stick weed (*Aster dumosus*), cumbungi (*Typha latifolia*) and barnyard grasses (*Echiniochloa crus-galli* and *Panicum colonum*) are undoubtedly making great headway throughout our rice fields.

Where banks are erected too early in the season to allow of that portion of the land being sown with safety, it is suggested that, as a means of weed control, rice seed be broadcasted on the banks at a period when a germination can reasonably be expected, and the seed covered by dragging along both sides of the check banks harrows coupled to a pole at the back as well as the front, an old wire gate, or some other suitable device to prevent side slip.

The efforts of the competitors at weed control, while excellent in several instances, were barely up to the standard of last year, but this was no doubt due to the season being ideal for the growth of all types of weeds, more particularly on channels and check banks.

The blue and orange coloured rice beetle (*Laius femoralis*), which is by far the worst of the insect pests yet found affecting the rice fields, damaged a portion of several of the entries when the grain was in the milk stage. Other crops sown throughout the Area were also severely damaged by this insect during February, March, and early April this year. As the crops are invariably attacked from the outside edges, where channels, check banks, or adjoining paddocks not under rice have become infested with barnyard grasses, which are a host of this pest, the necessity for weed control on the banks, and clean cultivation, heavy grazing, or suitable cropping of paddocks adjoining rice fields is obvious if this beetle is to be kept under control in localities where it has made its appearance.

Seeding.

The rates of seeding ranged between 90 and 125 lb. per acre, and by the general appearance of the crops seen during the judging, as well as throughout the Area, there appears to be no apparent reason for altering the present recommended rates of sowing good seed with the drill, viz., 100 to 110 lb. per acre on new land, and up to 125 lb. per acre on land which has previously grown rice.

The necessity for careful selection of rice seed showing as little variation as possible from the true Caloro is once again emphasised, as a trace of red rice was seen in several of the entries, and it is again showing up slightly in a number of crops throughout the Area. While the quantity of red rice in these crops has been so small in the past that it has not been noticed till this year, and although perhaps not sufficient to effect materially the grade of this year's product, if sown again next season sufficient red grains may be produced to cause a great deal of monetary loss and inconvenience to the growers.

As was done last year the careful selection of crops showing the required qualifications has again been carried out, the seed has been stored separately by the Rice Marketing Board, and any settlers requiring fresh supplies should lose no time in notifying the Board of their requirements.

The Effect of Fertilisers.

Mr. K. B. R. Harrison's heavy-yielding entry, grown on a red clay loam of a slightly puff nature which had grown a crop during the 1927-1928 season, and sown at the rate of 120 lb. of seed per acre, was top-dressed at various rates per acre with sulphate of ammonia alone, superphosphate and sulphate of ammonia, and superphosphate alone. Experiments carried out along similar lines during the past couple of years indicate that at the present stage of rice growing, applications of sulphate of ammonia at the rate of 1½ to 2½ cwt. per acre to land which has grown rice previously give satisfactory results, and that top-dressing with superphosphate alone is unsatisfactory. Mr. Harrison's experiment appears to bear out previous results along these lines, as all the bays treated with sulphate of ammonia were considerably heavier yielding than the superphosphate-treated and unmanured bays.

Provided that sowing and germination take place early enough in the season to enable rice to mature with a minimum of risk of the harvesting operations being held up by wet conditions, settlers using land which has previously grown rice might give this question of top-dressing some consideration, but for the sake of those who may sow late in the season, it must be pointed out that while rice matures a little earlier on old rice land, almost without exception rice bays treated with sulphate of ammonia mature a little later than unmanured bays, the degree of lateness ranging from a week up to several weeks, the lateness of maturity being in no small measure governed by the type of soil, the period of sowing, and the quantity of sulphate of ammonia applied. The heavier the application the later the rice matures.

Lettuce Varieties in New South Wales.

[Continued from page 624.]

N. S. SHIRLOW, B Sc.Agr., Assistant Plant Breeder, Hawkesbury Agricultural College.

Descriptions of Varieties.

All-the-Year-Round.

A BUTTER type, cabbage-heading lettuce; plants medium to small, compact with large proportion of head compared with leaves; head well blanched, firm but not very hard; leaves broad, crumpled and blistered, with entire margins; colour light, bright green with no reddish or brownish colouration; seeds blackish.

Season.—Early maturing, sure heading, and stands well in hot weather for an early-maturing variety.

Quality.—Good, soft, buttery and sweet.

Synonym.—Mammoth Salamander.

Chief Distinguishing Characters.—Somewhat like Long Standing, but more compact, with smaller amount of leaves compared with head.

Big Boston.

A butter type, cabbage-heading lettuce. The young plants have upright leaves and show a fair amount of twisting, while the mature plants are of medium to large size; heads round to slightly pointed with fairly closely-packed leaves, turned and twisted back at their uppermost borders; leaves broad, fairly stiff and thick, lightly blistered and crumpled undulate at borders, with margins somewhat scalloped; colour light dull green, tinged with reddish-brown, mainly at the border; inner leaves not coloured; seed whitish.

Season.—Mid-season maturity, sure heading in both winter and summer, but runs to seed fairly quickly in hot weather.

Quality.—Medium, rather hard in texture for a butter type lettuce.

Chief Distinguishing Characters.—Most like California Cream Butter or May King. Distinguished from the former by whitish seeds and light dull colour, and is more spreading than the latter.

Boston Curled.

Crisp, curled type, prickly-leaved, bunching instead of forming heads. Plants small, fairly compact, growing close to the ground and forming a loose, slightly flattened cluster of leaves a little spread from the centre, not dense enough for blanching; leaves fairly broad and slightly blistered, not crumpled or twisted, veins and midrib coarse, margins finely serrated and borders excessively frilled; colour medium green, never brownish or reddish in any part; seeds blackish.

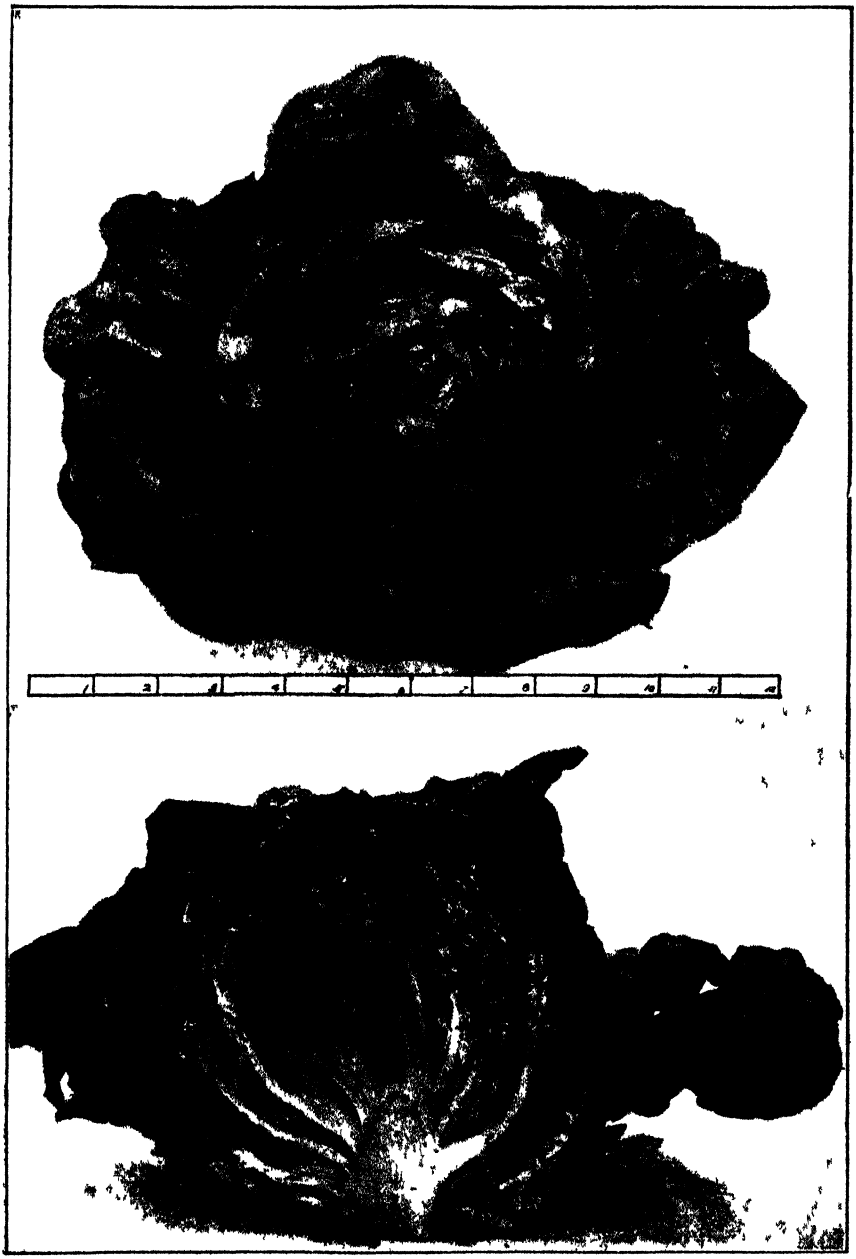


Fig. 1.—All-the-Year-Round.

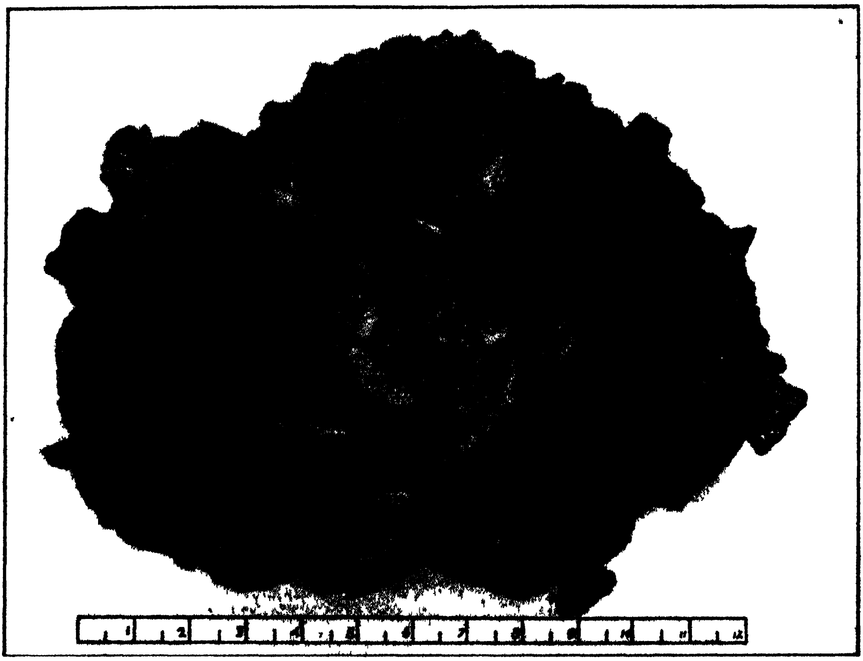
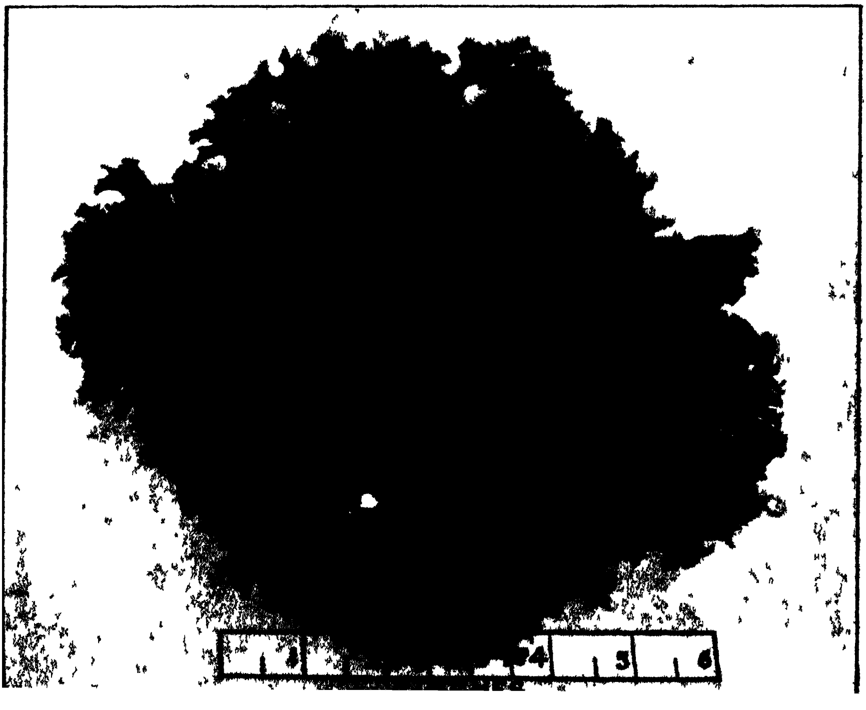


Fig. 2.—Big Boston.



Season.—Early maturing, shoots to seed quickly in hot weather.

Quality.—Very poor, lacking in sweetness; of little use on account of poor flavour, small size and wilting after being pulled.

Chief Distinguishing Characters.—Smaller in size and of a darker green colour than Grand Rapids.

Brittle Ice.

Crisp, curled type, cabbage heading; plants very large, but not particularly spreading in habit, upright, especially when young; heads at first conical. later round, compact but not particularly hard on account of spaces between the leaves forming the head; the leaves forming the head are twisted, giving the whole plant a twisted appearance right up to maturity; outer leaves broad, large, considerably twisted with coarse midrib and veins, surface smooth to slightly blistered, margins broadly serrated and borders lightly frilled; colour light dull green; seeds white.

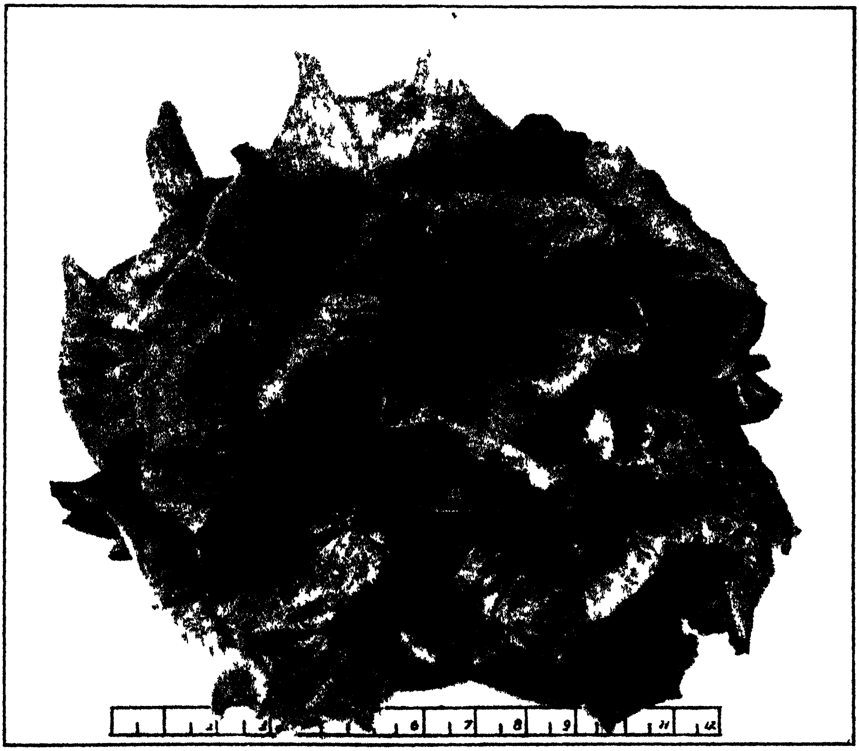


Fig. 4.—Brittle Ice.

Season.—Late maturing; a good winter variety and stands fairly well in summer.

Quality.—Rather coarse and inclined to be hard in texture, but of good flavour and exceptionally crisp. Not very suitable for carrying to market, as a large part of the lettuce would probably be damaged on account of excessive crispness.

Synonym.—Cool and crisp.

Chief Distinguishing Characters.—Most like Drumhead, and distinguished from that variety by a dull green colour and smoother leaves.

California Cream Butter.

A butter type, cabbage-heading lettuce; plants medium in size and of medium compactness; heads globular, well defined, well blanched, with leaves closely overlapping one another, firm but not hard; leaves broad, blistered and crumpled, slightly twisted, thick, not serrated at margins and flat or partly blistered at borders; colour, medium to dark glossy green, lightly spotted with reddish-brown and tinged, mainly at the borders; inner leaves show no reddish colouring; seeds blackish.

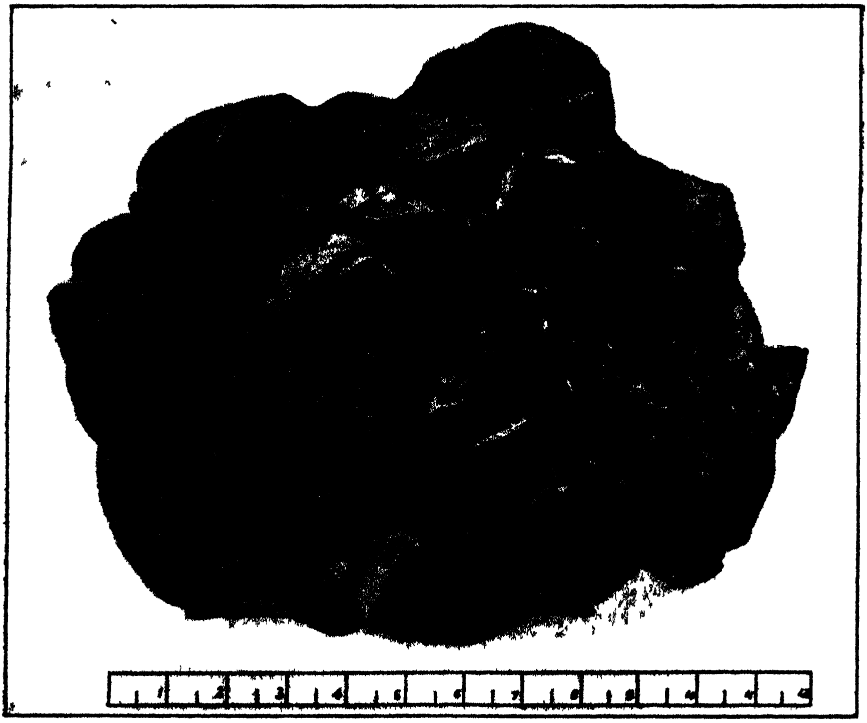


Fig. 5.—California Cream Butter.

Season.—Of medium maturity; produces fair heads in cool weather and shoots to seed fairly quickly in summer.

Quality.—Good, buttery and fairly sweet.

Chief Distinguishing Characters.—Most like Big Boston, but of a darker and brighter green, and has blackish seeds.

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Continuity.

A butter type, cabbage-heading lettuce; young plants rather flat in appearance, mature plants more upright; small and compact; heads solid, buttery, well balanced and globular in shape; leaves rather thin for a butter type, broad, blistered and crumpled, margins waved but not serrated or frilled; colour reddish to dark green with inner head leaves creamy; general appearance of plant reddish; seeds blackish.

Season.—Mid-season, stands cold conditions well and does not run to seed quickly in summer.

Quality.—Good, buttery and sweet.

Chief Distinguishing Characters.—General reddish appearance, must not be confused with Mignonette, which has the same colouring, but is a crisp type.

(*To be continued.*)

IMPORTS AND EXPORTS OF FRUIT.

THE following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th June, 1931:—

Description	Imports.	Exports
Interstate.	Cases	Cases
Fresh Fruit	515.544	86,357
Tomatoes ...	54,419	...
Bananas	75,127	...
	bunches.	
,, ..	4,033	
	cases.	
Pines ..	34,319	...
Melons . ..	38	. .
	lb.	lb.
Canned Fruit .	160,776	840
Dried Fruits—		
Unspecified ...	13,440	56
Currants	7,084	168
Raisins	7,476	112
Apricots ...	896	...
Apples ...	1,596	...
Peaches ..	224	...
Pears	392	
Prunes ...	1,484	152,720

Description	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruits—		Centals.	Centals
Apples .	... .	.	13,406
Bananas ...	....	2,856	480
Lemons ..	....	...	1,260
Oranges .	....	6	11,589
Grape Fruit ..	....	133	14
Pears ..	.. ..	...	2,950
Pineapples	....	...	1,308
Other .. .	....	541	8,162
Dried Fruits—		lb.	lb
Apples ..	.. . .. .	...	6,274
Apricots ..	....	...	18,388
Currants	....	...	88,286
Peaches ..	... .	..	29 696
Prunes ..	Commonwealth.	840	108,870
Raisins—			
Sultanas .	....	...	218,290
Lexias .	....	...	8,568
Other	.....		896
Dates ..	Mesopotamia .	26,385	8,487
Other	China	1,367	1,568
Preserved in liquid—			
Apricots ..	....	...	340,848
Peaches ...	....	...	1,640,949
Pears	....	...	6,485
Pineapples ...	....	...	796
Raspberries	....	...	108 960
		Gallons.	
Other ...	....	110	19,862

Southern and Western Districts Potato Crop Competitions, 1930-31.

RESULTS OF LOCAL COMPETITIONS AND R.A.S. CHAMPIONSHIPS.

A. J. PINN, H.D.A., Special Agricultural Instructor.

COMPETITIONS were carried out in the southern district at Crookwell (fifty-nine entries), Taralga (thirty-three entries), Batlow (twenty-six entries), and Berrima (nine entries), with a total of 127 entries. In the western district entries were received from Millthope (twenty-five entries), Orange (eighteen entries), and Oberon (twelve entries), making a total of fifty-five entries, and a grand total for all districts of 182 entries. This represents an increase of fifty-four entries over last year. All districts represented last year again competed this year, and Berrima made its inaugural entry.

The Championships.

In both the southern and western districts the Royal Agricultural Society organised a championship competition, and in each case a silver cup trophy was donated. It was necessary that the winner of a local competition cultivate at least 5 acres of potatoes on his farm to be eligible to compete for the district championship. Each of the winners in the seven local competitions cultivated the stipulated area and was therefore eligible to compete.

The points awarded are shown in the following tables:—

SOUTHERN DISTRICT CHAMPIONSHIP.

Competitor.	Variety.	Yield per acre.	Points awarded—							
			Yield (5 points per ton).	Freedom from disease.		Quality.		Purity.	Allowance for previous cropping.*	Total points.
				Tops.	Tubers.	Appearance.	Cutting.			
Maximum Points ...	...	...	...	8	7	15	15	15	...	...
		t. owt.								
1. Conlon Bros., Exeter	Factor ...	10 9	52¼	5	6¾	13½	13	15	5	110½
2 M. McDonald, Crookwell.	Factor ...	9 17	49¼	4½	6½	12½	12¾	14½	3	103
3. E. M. Herring, Batlow.	Redsnooth	9 8	47	7½	5	13½	14¼	15	...	102¼
4. J. Maloney, junior, Taralga.	Factor ...	8 0	40	5¾	6¾	12¼	13	15	...	92¾

* One point for each crop grown on the land during the previous ten years, with a maximum of 5 points.

WESTERN DISTRICT CHAMPIONSHIP.

Competitor.	Variety.	Yield per acre.	Points awarded—							
			Yield (5 points per ton).	Freedom from disease.		Quality.		Purity.	Allowance for previous cropping.*	Total points.
				Tops.	Tubers.	Appearance.	Cutting.			
		t. cwt.								
C. Oates, Millthorpe ...	Factor ...	8 17	44¼	7¼	6¾	13	12¾	15	1	100
T. E. Fuller, Spring Terrace, Orange.	Late Manhattan.	6 19	34¾	6½	6	13¾	14	14¼	5	94¼
G. H. Spencer, Gingkin, Oberon.	Satisfaction	5 12	28	...	6¾	14¼	14	15	...	78

* One point for each crop grown on the land during the previous ten years, with a maximum of 5 points.

The cultural details of each plot are given in the reports of the local competitions. The scale of points adopted last season was adhered to without alteration. The yields quoted are for marketable potatoes, after excluding grubby, wilted, blighted, and "pig" tubers, &c.

Comments on the Championship Competitions.

The results this year have again favoured closer planting. The average spacing between the rows of the winners of the seven competitions was twenty-nine and one-third rows to the chain. Those tableland growers who adopt the wide spacing of twenty-two rows per chain are therefore at a disadvantage in regard to obtaining high acre yields.

It is pleasing to note each year an increase in the number of competitors who "peg" the good type plants during growth, and later make a further selection at digging time with a view to using the "seed" so selected for the planting of stud plots during the following season. This action, coupled with a continual watchfulness for the purpose of eliminating any plants which during the growing period give an indication of being infected with virus disease, must result in producing higher-yielding strains of potatoes than was common in past years.

Berrima District Competition.

This was the first competition carried out by the Berrima District P. and A. Society, which donated £3 3s., £2 2s., £1 1s. for first, second, and third prizes respectively. Ent[illegible] were obtained chiefly from Exeter and Kangaloon.

The points awarded the place-getters were as follows:—

AWARDS (of leading competitors only) in the Berrima District Competition.

Competitor	Locality.	Variety	Planting distance (rows per chain).	Yield per acre.	Points Awarded.							
					Yield.	Quality.		Freedom from Disease.		Purity.	Allowance for previous cropping.	Total.
						Appearance.	Cutting.	Tubers.	Tops.			
				t. c.								
Conlon Bros ...	Exeter ...	Factor ...	33½	10 9	52¼	13½	13	6½	5	15	5	110¼
Conlon Bros. .	Exeter ..	Early Rose .	26½	6 6	31¼	13¾	13½	6½	7	15	5	94½
R. Conlon	Bundanoon	Early Vermont	24½	7 4	36	13¾	14½	6½	6	15	Nil	91¾

Messrs. Conlon Bros., who won this local competition, also won the Royal Agricultural Society's Southern District Championship. Theirs was no chance victory, but the result of years of close attention to selection and good cultivation methods.

A Crop in the Berrima District.

The winning plot was old land, for the most part a red basalt, on which alternate plantings of peas and potatoes have constituted the rotational practice for some years past. It was ploughed in April, and between that date and planting on 14th October received two ploughings, two spring-tooth cultivations, and two harrowings.

The sets were cut from tubers of from 3 to 4 inches in diameter, dipped as a preventive of scab and spread out in a shed to "green." They were dropped in furrows after the plough, fertiliser being distributed in the furrow by machine. The spacing between the rows was very close, being just under 2 feet. The fertiliser used a mixture of 2 cwt. superphosphate and 50 lb. sulphate of amm ter-cultivation consisted of harrowing and hilling of the crop, the latter being carried out in two operations. The tubers were of excellent appearance.

The second prize plot, also grown by Messrs. Conlon Bros., was situated on an old cultivation area which has been in use for the past sixty years. On this area the distance between rows was wider, and the potatoes were apparently not so deeply set, as there was considerable rejection on account of potato grub. The sample as weighed, however, was a very bright and clean one. Except that the sets were dropped in drills, the seed was treated in a similar manner to the winning plot.

Mr. R. Conlon, Bundanoon, secured third prize with a crop of Early Vermont. The yield was a very satisfactory one, and an excellent sample of good cutting quality was obtained. The seed was set very deep, and this no doubt was largely responsible for the good cutting quality. Superphosphate alone at the rate of 2 cwt. per acre was used in this case.

Batlow District Competition.

This was the fourth annual field potato competition carried out by the Batlow Branch of the Agricultural Bureau. The competition was divided into two sections, and provided for white-skin varieties in one section and red-skin varieties in the other. Cash prizes of 30s., 18s., and 12s. were awarded for first, second, and third places respectively in each section.

The weather conditions during the season were generally satisfactory, except for a dry spell during February and a severe frost on 22nd of the same month, which caused damage to crops in low areas.

Of the twenty-six original entries, twenty-two remained for final adjudication, of which fifteen were white-skins (all Factors) and seven red-skin varieties.

The points awarded the winners are given in detail in the following table:—

AWARDS (of Leading Competitors only) in the Batlow Competition.

Competitor.	Variety.	Rows per chain	Yield. per acre.	Points awarded.							
				Yield	Quality		Freedom from disease		Purity.	Allowance for previous cropping	Total
					Appearance.	Cutting	Tops	Tubers.			
			t. cwt.								
White-skinned Varieties.											
J. A. Bartell ...	Factor ...	29½	8 12	43	12½	13¼	4½	5¼	15	1	94½
C. Barberie ...	Factor ...	23	8 12	43	13	13	2	6½	14½	1	93
R. Quarmby ...	Factor ...	31	7 17	39¼	12¾	13	3¾	6	14¼	3	92
Red-skinned Varieties.											
E. M. Herring ...	Redsmooth	27	9 8	47	13½	14¼	7½	5	15	...	102¼
C. Barberie ...	Satisfaction	29	9 13	43¼	14¼	13¾	...	6¾	15	...	98¼
Butz Bros. ...	Satisfaction	31	7 [illegible]	[illegible]	[illegible]	[illegible]	...	6½	11	...	81½

Two harrowing

The average yield of the twenty-two plots was 7 tons 2 qr., which is the highest yet obtained in any similar competition carried out in this State. In the white-skin section the fifteen entrants averaged 7 tons 2 cwt. and the seven red-skin plots 6 tons 17 cwt.

The purity standard was for the most part satisfactory, but evidently some competitors were lax in attending to the elimination of diseased plants in their plots before first inspection and thus lost points, which in the case of one competitor lost him the premier position. The percentage of scab was somewhat in excess of previous years. The appearance of the potatoes was generally pleasing, and the cutting quality on the whole was also good.

Mr. E. M. Herring selected a plot of new land for the crop with which he won this year's competition. It was ploughed on 18th June, and later disced and harrowed. Planting was carried out on 27th and 28th November, using 2 oz. seed. Superphosphate at 2½ cwt. per acre was applied by hand in the furrows at planting. The only after-cultivation consisted of a harrowing and hand pulling of bracken fern.

The tubers lost points on appearance owing to a percentage of long, pointed-end types, and scab infection was rather heavy

Mr. C. Barberie gained second prize in the red-skin section with Satisfaction, grown on a particularly good piece of land, first ploughed on 25th July and again on 7th November. Planting took place on 2nd December, seed being selected from high-yielding stalks of the previous year, and for the most part of large size and cut into two sets. Superphosphate at 3 cwt. per acre was applied in the furrow at planting. The plot was harrowed immediately after planting, and was scarified on 5th and 27th January.

The crop lost points through virus infection, but had the lowest infection of all crops of this variety which came under the notice of the judge. The tubers were of excellent form and gained a high award for appearance. The loose texture of the soil, which was apparently largely composed of rotten bracken, considerably helped in the good shape and appearance. The cutting quality was fairly satisfactory, but the tubers were not equal in colour and texture to those from the winning plot of Redsnooth.

Mr. J. Bartell, who again won the competition for white-skins, used the same land which produced the winning plot last year, and thus gained one point on this account. The plot was ploughed on 6th September, and harrowed each month up to planting on 4th December, when fairly large cut seed was used. The after-cultivation consisted of harrowing during December, January, and February.

The appearance of the tubers was not equal to that from some of the district red soil areas, but the cutting quality was somewhat better than most other samples of this variety.

Mr. C. Barberie secured second prize in this section also. First ploughing was given on 24th July, following last year's potato crop, and the plot was again ploughed on 7 [illegible] Planting took place on 2nd December when 4 cwt. of superph [illegible] acre was distributed in the furrows.

The seed was from selected plants and the after-cultivation consisted of a harrowing immediately after planting and inter-row cultivation on 5th and 27th January.

Crookwell District Competition.

On account of the damage due to frost in February a number of the plots were withdrawn, but forty-three plots remained for final adjudication and gave the very fine average yield of 6 tons per acre. The winner will receive a trophy (value £5 5s.) presented by the organising body—the Crookwell A., P. and H. Society.

The points awarded the place-getters are given in the following table:—

AWARDS (of Leading Competitors only) in the Crookwell Competition.

Competitor.	Variety.	Rows per chain.	Yield. per acre.	Points awarded.							
				Yield.	Quality.		Freedom from disease.		Purity.	Allowance for previous cropping.	Total.
					Appearance.	Cutting.	Tops.	Tubers			
			t. cwt.								
M. McDonald ...	Factor ...	30	9 17	49¼	12½	12¾	4½	6½	14½	3	103
E. Nugent ...	Carman ...	29½	8 14	43½	12¼	13¾	7¼	5½	15	...	97¼
D. Harries ...	Late Factor	26	8 13	43¼	12½	12¾	6¾	6½	15	...	96¾

Mr. Moreton McDonald obtained first prize with a crop which was grown on land which has been under cultivation for approximately fifty years, except for the previous five years when no cropping took place. The soil is a dark basalt of excellent quality.

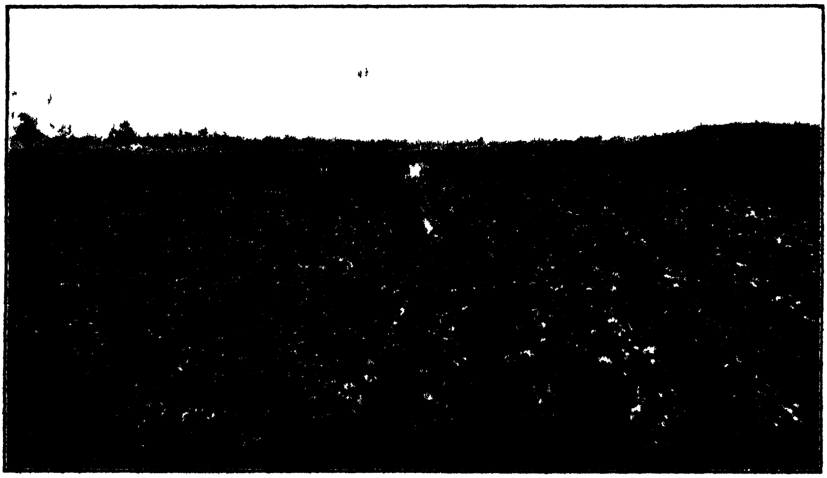
The first ploughing took place on 15th August, and the only cultivation previous to planting on 10th November was harrowing. Cut and whole seed was used and dropped after the plough, and 1½ cwt. superphosphate per acre was applied in the furrow. The after-cultivation consisted of harrowing only. The seed was selected from crops previously grown on the farm.

Mr. E. Nugent, of Bannister, obtained second place with a crop of Late Carman. First ploughing was given at the end of August and after-cultivation consisted of harrowing only. Both cut and whole seed was used. The seed was produced from a crop grown from second growth "knobs" produced on large potatoes. Superphosphate was applied at the rate of 2¼ cwt. per acre.

Mr. D. Harries, also of Bannister, secured third place with a crop of Late Factor. The seed was selected at digging the previous year, and was dipped in corrosive sublimate. Planting took place on 21st November. The fertiliser used was 350 lb. superphosphate, 100 lb. sulphate of ammonia and 80 lb. nitrate of soda per acre. Two harrowings were given after planting.

There was distinctly less scab as the result of the dipping of the seed. The appearance of the potatoes in this district was for the greater part very fine, but the cutting quality of some "Factors" was not of the high standard of the Carman or Gold Coin samples. Where the crops were badly frosted in February the size of the potatoes was on the small size, but of excellent quality from a seed point of view, as all the good type plants produced plenty of seed and the poor types practically nil. The best growing sample was that produced by Mr. Alex. Willis on a hillside plot of new land which had previously grown a heavy growth of bracken fern. The decomposed bracken produced a very friable soil and the tubers were of excellent appearance and cutting quality. Mr. C. W. Plumb also produced a crop of Factor of excellent appearance.

I would advise growers in the district not to persist with the growing of the Late Factor variety, and would also suggest that the odd late plants which may be found in the Factor crop be eliminated. This late strain is not suitable for coastal growers, which is the chief consideration when it comes to the disposal of seed potatoes.



A Crop of Factor Growing in the Taralga District.

Taralga District Competition.

This was the fifth annual competition carried out by the Taralga A., P. and H. Society, which donated a handsome silver cup for the winner and a cash prize of £1 1s. for second place. Twenty-eight of the original thirty-three entries remained for final judging.

The season was rather a peculiar one. The early spring was satisfactory from the point of view of rainfall, but later, in the early summer, dry weather prevailed, and in addition an early frost occurred in January which did considerable damage to two plots and caused a minor check to many others. After the first useful rain was received, a further frost caused considerable damage, more particularly to many crops on the northern section of the district. Had this unseasonable frost not appeared there would have been many very high yields. Notwithstanding these setbacks, the general performance of the competition plots must be considered as highly satisfactory, the average yield being 5 tons 9 cwt.

The points awarded the winners are shown in the following table:—

AWARDS (of Leading Competitors only) in the Taralga Competition.

Competitor	Variety	Rows per chain	Yield per acre	Points awarded							
				Yield	Quality		Freedom from disease		Purity	Allowance for previous cropping	Total.
					Appearance	Cutting	Tops	Tubers			
			t cwt								
J. J. Maloney, jun	Factor	25	8 0	40	12¼	13	5¾	6¾	15		92¾
W C Dawson	Factor	27	7 12	38	13	13	5	6¾	15		90¾
D. Wright .	Factor	27	7 0	35	12¼	13	7	6¾	15		89

Mr. J. J Maloney, junior, won the silver cup with a very fine crop of Factor grown on a hillside plot of virgin soil, which varied from a rich chocolate to a lighter clay loam. The plot was first ploughed in July. Three harrowings were given before cross ploughing, after which a further two harrowings were given. Whole seed was used for planting which was carried out on 3rd November after drilling in 300 lb. per acre of superphosphate. The seed was dipped in corrosive sublimate solution some time previous to planting.

The crop made very even growth throughout the season and always looked like a winning crop. The cutting quality was satisfactory for the variety, Factor.

Mr. Dawson gained second prize on his first entry into the competition. The first ploughing was undertaken on 28th June and the land was twice harrowed before second ploughing on 1st October, after which a further harrowing was given. Planting took place on 28th October, when small- to medium-sized whole seed was dropped following the plough. No fertiliser was used. The tubers were of excellent appearance and cutting quality was satisfactory.

Third place was gained by Mr. D. Wright, who broke up his new land on 1st August to a depth of 8 inches and gave a further cross-ploughing, Planting took place on 10th November, when seed was hand-dropped behind the plough, together with 250 lb. per acre of a proprietary mixture. Both cut and whole seed was used. The after-cultivation consisted of one harrowing, one inter-cultivation and a slight hilling was given the rows. A good "run" of potatoes was secured and there was practically no waste. The cutting quality was satisfactory.

Millthorpe District Competition.

This was the second competition conducted by the Millthorpe A., H. and P. Association. Prizes awarded by the society were:—First £5, second £3, and third £2.

Of the twenty-five entries inspected at first judging, seventeen completed the final stage. The average yield of all plots was 5 tons 17 cwt., which must be regarded as very satisfactory. The eight Factor plots gave the very high average of 7 tons 5¼ cwt. per acre. The whole of these plots were planted with seed secured from another district last year, and the result has justified the expense the growers were put to in visiting this district and purchasing the seed. The stand of each of the crops planted with this seed was much superior to that of the best local seed of Factor which growers were previously cultivating. It is very pleasing to see attention being given to the crops to keep down virus infection, and it is hoped that with similar attention to the Early Manhattan variety, which is also so popular in this district, the yield of this variety will also be largely increased and off types eliminated.

Factor Potatoes at Millthorpe.

Left: A crop from local seed. Right: A crop from selected seed from another district.

Details of the points awarded the winners are given in the following table:—

AWARDS (of Leading Competitors only) in the Millthorpe Competition.

Competitor.	Variety.	Rows per chain.	Yield per acre.	Points awarded.							
				Yield.	Quality.		Freedom from disease.		Purity.	Allowance for previous cropping.	Total.
					Appearance.	Cutting.	Tops.	Tubers.			
			t. cwt.								
C. Oates ...	Factor ...	29	8 17	44¼	13	12¾	7¼	6¾	15	1	100
A. Kingham ..	Factor ...	20¾	8 17	44¼	13	12¾	7¼	6¾	15	...	99
J. Moad and Sons	Factor ...	26⅔	7 14	38½	13	12¾	7½	6¾	15	...	93½

Mr. Cliff Oates, "Rosebank," Millthorpe, won first prize, and also the Royal Agricultural Society's championship for the western district. The yield from this plot was similar to that of Mr. A. Kingham's, but Mr. Oates obtained 1 point allowance for previous cropping, as the area had previously grown a potato crop in 1927. The first ploughing was given in the first week of September, and the plot was harrowed immediately afterwards. No further cultivation was given until the crop was planted on 21st and 22nd November when whole seed, about 3 oz., was dropped from a box through a funnel under the second furrow of a three-furrow plough. No fertiliser was given. The after-cultivation consisted of one harrowing only on Boxing Day.

Mr. A. G. Kingham, "Athloy," Blayney, secured second prize. The land on which the crop was grown had not been cropped during the previous twenty years. First ploughing was given during the first week in September, and the land then immediately harrowed. It was harrowed again during the last week of September, and a further harrowing and cultivation given in the second week of November. Planting took place on 2nd December, when whole, medium-sized seed was used. Seed was dropped from the plough. Superphosphate at 2 cwt. per acre was drilled in a week before planting. The plot was harrowed after planting and again on 26th December, and inter-row cultivated during the last week of January.

Mr. Kingham adopted wide planting, the rows being 20¾ to the chain. The yield per row was the heaviest dug in any competition in the State this year. A 5-chain row yielded 4 cwt. 1 qr. 1 lb. A good size was obtained throughout.

Messrs. J. Moad and Sons, "Fairfield," secured third prize. New land was used and was first ploughed in the first week of September and was harrowed the same month. The plot was cultivated during the second week of October and planting took place on 12th November. No fertiliser was used. The after-cultivation consisted of a harrowing when the potatoes were breaking ground, and an inter-row cultivation in early January.

Frost caused damage in some low areas and reduced yields; this was general throughout the district. Some competitors received the benefit of an early shower, which no doubt was largely responsible for the high yields of the first and second prize-winners.

The variety, Snowflake, grown for the first time in this district, was particularly disappointing, and the shape was certainly sufficient to cause the variety to be discarded in the future. The cutting quality of this variety was no better than Factor. The Redsnooth sample was not of very good appearance owing to the many elongated types. The colour, of course, is always attractive, but the cutting quality was very disappointing, as a good deal of fleck and hollow heart was in evidence. The cutting quality of all Factor samples was on a par and not particularly high. The one sample of Carman was most satisfactory from a cutting point of view as were also the Early Manhattan samples.

Orange District Competition.

Sixteen of the original eighteen entries remained in for final judging in this, the second, competition promoted by the Orange A. and P. Association. As was the case last year the competition was divided into two sections and prizes of £5 5s. and £2 2s. were awarded for first and second, respectively, in each section, together with a silver cup for the highest award of both sections. Eleven entries completed in the coloured-skin section and five in the white-skin section.

The average yield of the sixteen plots was 5 tons 2 qrs. The eleven plots which were of the Early and Late Manhattan varieties, gave an average yield of 5 tons 9½ cwt., whereas the five white-skin plots only averaged 4 tons.

The details of the points awarded the winners are set out in the following table:—

AWARDS (of Leading Competitors only) in the Orange Competition.

Competitor	Variety	Rows per chain	Yield per acre.	Points awarded							
				Yield	Quality.		Freedom from disease		Purity	Allowance for previous cropping	Total.
					Appearance	Cutting	Tops	Tubers.			
			t. cwt.								
			Coloured-skin Section								
T. E Fuller ...	Late Manhattan	31½	6 19	34¾	13¾	14	6½	6	14¾	5	94¾
M. Hiney ...	,, ...	27	7 1	35¼	13¾	13¾	8	5¾	14½	1	92
N. McClymont ...	,, .	29	5 11	27¾	13¾	13¼	7¼	6	15	5	88½
			White-skin Section.								
K. Bowen ...	Factor .	27	5 8	27	12¾	12¾	...	6¾	15	...	74¼
M. Hiney ...	,, ...	26½	4 10	22½	13	12¾	...	7	14½	...	69¾
Mrs. E. M. Bull ..	Carman ..	25½	3 6	16½	12½	12¾	7	7	13¾	...	69½

Mr. T. E. Fuller again won the highest award of both sections and thus, by winning the prize two years in succession, secured permanent possession of the silver cup. The winning plot was grown on old land cropped to potatoes for many years, and secured the maximum allowance of 5 points for previous cropping. The soil is of basaltic origin, and was first ploughed on 1st August, and immediately harrowed. A second ploughing was given in mid-October and between then and planting during the first week of December the plot received three harrowings. Whole seed of about 2½ to 2¾ oz. was dropped off the plough into the middle furrow. Fertiliser consisting of 360 lb. superphosphate and 180 lb. of sulphate of potash per acre was applied with the drill about a week before planting. The after-cultivation consisted of a harrowing immediately after planting and again early in January when the plants were above ground. An inter-row cultivation was given early in March.

Close planting at the rate of 31½ rows per chain was adopted by Mr. Fuller. The tubers were of a smaller "run" than last year. The cutting quality was excellent.

A Potato Crop in the Orange District.

Second prize in the coloured-skin section was secured by Mr. M. Hiney with a crop of Late Manhattan, which gave the highest yield in the competition, but as the plot had not previously been cropped to the same extent as Mr. Fuller's, it only obtained an allowance of 1 point for previous cropping. First ploughing was given on 25th July, and the land was harrowed once before second ploughing, which was given during the first week of November. Two harrowings were later given and planting took place on 23rd November, the potatoes being dropped after the plough. No fertiliser was applied. The after-cultivation consisted of a harrowing and the crop was horse-hoed twice during growth.

In the white-skin section Mr. K. Bowen secured first prize with a crop of Factor and second prize, as in the other section, was secured by Mr. Hiney. The white-skin section was most disappointing, as all the Factor plots contained a very high percentage of degenerate plants, and the two Carman plots did not receive suitable cultivation. It is interesting to compare the yields of the white-skins (particularly Factors) with the results obtained from the introduced seed used in the adjoining district by the Millthorpe growers. (See page 699.)

Oberon District Competition.

Three plots only were submitted for final judging in the Oberon Agricultural Society's second competition. Unfortunately in some areas of the district very heavy frosts cut short the life of many crops; so much so that it was at first decided to allow the competition to lapse. When it was realised that at least three districts must compete in order to fulfil the Royal Agricultural Society's qualifications for the Western District Championship, the local society arranged with a few competitors who had not dug their potatoes to allow the crops to remain for final adjudication.

The details of the awards made are given in the following table:—

AWARDS in the Oberon Competition.

Competitor	Locality.	Variety.	Yield per acre	Points awarded—							
					Quality.		Freedom from disease.				
				Yield.	Appearance.	Cutting.	Tops.	Tubers.	Purity.	Allowance for previous cropping.	Total.
			t cwt.								
G. H. Spencer ...	Gingkin ...	Satisfaction	5 12	28	14¼	14	...	6¾	15	...	78
H. Cunynghame...	Oberon ...	Satisfaction	3 1	15¼	13¾	13½	7	6½	15	...	71
T. O'Connell ...	Duckmaloi	Big Top Brownell.	4 8	22	13¾	7	6	6½	11¼	...	66½

The plots were widely distributed, and in view of the seasonal conditions are not comparable. The average yield of the three plots was 4 tons 7 cwt.

Mr. G. H. Spencer, of Gingkin, won the £3 prize donated by the society. His potatoes were of the best appearance and cutting quality.

Mr. H. Cunynghame was unfortunate in having his plot severely frosted at an early stage of growth. This plot had the best score for freedom from disease as manifest in the top growth and gave every indication of producing a heavy yield from the appearance, but the cutting quality was very bad.

ESTABLISHMENT *of* PASTURES

The young plants during root establishment cannot forage to any extent for plant food It is therefore essential when seeding a pasture to use a balanced mixture of readily available fertiliser. When the clovers become established, they are able to fix their own nitrogen and require phosphate applications only. The grasses, however, become nitrogen starved during the cold months and show little growth unless supplied with this plant food. Consequently, for the production of a good ' soil cover," the exclusion of weeds, and a balance between grasses and clovers, newly sown pastures should be fertilised as follows·—

A—IN AUTUMN AT SEEDING—
2 to 3 cwts super per acre.
1 to 2 cwts. sulphate of ammonia per acre.

B—IN JULY—
1 to 1½ cwts. sulphate of ammonia per acre

Applications of nitrogen will, in addition, provide valuable Winter and early Spring feed

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Tullibigeal
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Seed Setting in Lucerne.

SOME OBSERVATIONS ON THE CONTROLLING FACTORS.

R. E. DWYER, B.Sc.Agr., Assistant Plant Breeder.

SEED setting in lucerne is a matter of considerable moment to the commercial grower of lucerne seed, and the cause of light seed crops is the subject of much speculation. The knowledge available on this subject is still comparatively meagre, and further detailed investigations are required. The factors governing seed setting in lucerne are also of great importance to plant breeders, and a fundamental knowledge of the subject is essential if breeders are to make the best progress in the improvement of lucerne.

Although lucerne can be grown successfully under many different climatic conditions, it is well known that climate is a limiting factor in the production of seed. For this reason lucerne seed production on a commercial scale is confined to particular districts, but even in these districts the seasonal weather conditions, together with the soil conditions and other factors, play a large part in determining the actual yield of seed.

Investigations have been commenced at Bathurst Experiment Farm which are designed to throw further light, if possible, on the subject of seed setting in lucerne. Meantime, a brief statement of the knowledge available to date is given, together with some recent observations by the writer.

The Lucerne Flower.

The structure of the lucerne flower is of interest because of the explosive mechanism which apparently functions to assist pollination. The sexual parts of the lucerne flower (staminal column and pistil) are enclosed in the keel under tension. A slight separation of the edges of the keel removes this tension, and the staminal column and its enclosed pistil "trip out" of the keel and force themselves against the broad standard (the largest petal of the flower).

It was at one time thought that fertilisation of the lucerne flower could not take place until the stigmatic cells had been already ruptured by the mechanical effect of the stigma striking the standard on tripping. Piper,[6] however, states that this theory has been disproved by tests in which the standard was removed from the flower before tripping.

It is stated by Piper[6] that only in rare instances do untripped lucerne flowers produce seed, but Carlson[3] found that in Utah lucerne flowers are capable of setting pods rather freely in the absence of tripping. It is generally agreed, however, that tripping of the lucerne flowers does increase the seed setting. This tripping may take place (*a*) automatically, (*b*) through the agency of insects, (*c*) artificially.

Climatic and Environmental Factors.

The positive exclusion of insects from a lucerne plant has shown that automatic tripping due to atmospheric or climatic conditions unquestionably occurs. This factor alone is probably responsible for a large part of the marked difference in seed production which occurs in different districts and in different seasons in the same district.

Piper[8] has induced considerable tripping of lucerne flowers by removing the screen from covered plants. This is explained by him as the result of increased transpiration from the turgid flowers. The writer is of opinion that the same effect is produced by a change to bright sunshine and higher temperatures after cool, cloudy, or rainy weather. These are the conditions, therefore, under which lucerne growers may expect a comparatively good seed setting. The lucerne breeder may control such conditions in the case of a few plants, but the grower has no control whatever over seed setting from this standpoint.

According to Stewart[9] all the important lucerne seed producing districts of the world are in arid or semi-arid regions. It is well known that lucerne will not set seed well under hot, dry conditions, such as occur on our western plains. In our case the failure is probably largely due to the blasting effect on the pollen (which fails to germinate) or on the seed (which fails to develop after fertilisation of the flowers), or both factors may operate together, or it may be due to the failure of the flowers to trip under the climatic conditions. The fact remains that there is not much possibility of commercial seed production under these conditions. These conditions may be improved for seed setting, however, by irrigation in such districts.

It is also well known that lucerne fails to set seed well under very wet and humid conditions, such as on our North Coast. When an abundant supply of moisture is contained in the soil, lucerne produces a rapid vegetative growth but sets little seed. Moreover, even when the supply of soil moisture is not so abundant as to produce a rank growth, a constantly humid atmosphere appears to militate in some way against seed production.

Ruling out the extreme climatic conditions which are unfavourable for lucerne seed development, there still remains, even in favourable districts, the question of seasonal climatic conditions. It seems that good seed production in lucerne initially depends largely on the tripping of the flowers, and that although this may be aided to some degree by certain insects, it depends mostly on the weather conditions. The optimum weather conditions appear to be cool, cloudy conditions, which induce a certain turgidity in the flowers, followed by bright, warm sunshine to remove suddenly the turgidity and to explode the tripping mechanism. Excessive wet or moisture in the atmosphere retains the turgidity in the flowers and they do not trip, while prolonged excessive dry heat during flowering does not allow the flowers to become turgid and the tripping mechanism does not function.

Alter[1] states that a mean monthly temperature of about 75 deg. Fahr. is favourable for the plant at the critical stage of blossoming, and that the maximum amount of sunshine is not the best in extremely dry regions, deducing from observations in America that an average cloudiness during the blooming period of 30 to 35 per cent. is probably about the optimum.

It is well known that a thick stand or a heavy growth of lucerne is not favourable for seed production. This is probably because many of the flowers remain shaded and do not become exposed to sunlight

Lucerne Seed-producing Districts.

The conditions indicated above appear to have determined the districts in New South Wales which have been found to be most suited to the commercial production of lucerne seed. The chief commercial seed producing districts in New South Wales are Tamworth, Hunter River, Mudgee, Canowindra, and Coolah, while good seed has also been produced on the Murrumbidgee Irrigation Area, at Gundagai, Bathurst, and some other centres.

It is significant that, with the exception of the Hunter River district, these centres have an annual rainfall of 22 to 26 inches. The annual precipitation in the Hunter River district varies from 24 inches at Scone, on the Upper Hunter, to 34 inches at Maitland, on the Lower Hunter. Although lucerne seed is produced in the Maitland district, it is usually only in dry seasons and from thin stands that any quantity of seed is harvested. Although lucerne is grown for hay, green fodder, or grazing in many other parts of the State, the rainfall is either too high or too low (combined with high temperatures) for successful lucerne seed production, except in occasional years.

Even in the recognised commercial lucerne seed producing districts the weather conditions during the season, and particularly during the flowering period, are closely watched by growers to enable them to decide whether a certain "cut" shall be allowed to go for a seed crop or be cut for hay.

Carlson[2] states that on the average, when lucerne flowers are from one to three days in the full bloom stage and from two to five days in the wilted stage, the chances are greatest that they will form seed pods. It seems that if the flowers remain longer in the fresh-looking full bloom stage without showing a tendency to wilt it may be taken that their continued turgidity is not allowing them to trip.

Lucerne seed growers should observe their fields closely for evidence as to the amount of tripping taking place to guide them in estimating the probable seed crop.

Although the critical environment appears to be initially that which determines the amount of tripping, immediately subsequent environmental conditions will determine the development of the embryo seed pods. Carlson[2] states that if the flowers remain in the wilted condition unduly long the chances are very great that they will strip before forming pods. Changes in the development of the flowers should occur in comparatively rapid succession if a good crop is to result. It seems, as the writer has pointed out, that variable, though not unfavourable, weather conditions during the flowering period of lucerne are desirable for the setting of a good seed crop.

Relation of Insects to Tripping and Pollination.

Although it is definitely agreed that insects of any kind are not essential for the tripping of lucerne flowers and for good seed production, it is thought that some insects are capable of assisting the tripping mechanism when environmental conditions are favourable for such tripping. Many observations have been made with honey bees in America, and it has been concluded that no significant amount of tripping of the lucerne flower is effected by such bees. In company with the writer, Mr. S. L. Allman, Assistant Entomologist, and Mr. T. Mau, Assistant Agrostologist, observed at Bathurst Experiment Farm that while honey bees generally inserted their proboscides at the base of the flower between the wing petals and the keel, and thus avoided tripping the flower, some bees alighted on the top of the keel, and apparently served to trip the flower while in this position. One bee was observed to trip thirty flowers in about fifteen minutes about 11 a.m. one day in February, when the sun temperature was about 108 deg. Fahr. A few days previously a bee was observed to trip four flowers in ten minutes at 4 p.m., when the sun temperature was about 100 deg. Fahr. Previous investigations at Bathurst had led to the belief that the optimum temperature for the tripping of lucerne flowers is about 104 deg. Fahr.

Further observations have been made and are being continued by the above workers and also the writer on the rôle of bees and other insects in lucerne pollination, and these will form the subject of a later publication.

According to Piper[6] the leaf-cutting bee in America (*Megachile latimanus*) is an excellent agent for tripping lucerne flowers, about 90 per cent. of the flowers visited being tripped by this insect, at the rate of fifty-five flowers per hour for each bee. Some species of the leaf-cutting bee are present in New South Wales, and observations are being made as to their efficacy in tripping lucerne flowers at Bathurst. Close observations on the above species working on lucerne flowers in America point to the fact that not only is this bee capable of tripping the flowers, but that cross-pollination by it may easily occur. This is not only of interest, but of great practical significance from the standpoint of breeding. It is known, for instance, that the lucerne flower is largely self-fertilised, and a knowledge of the manner and extent of cross-fertilisation, which lucerne breeders realise must also occur, is essential in any plan of improvement work with this crop.

Piper[6] has shown that cross-pollination, either by the same or by a different variety, is more potent than self pollination either by the same flower or by another flower of the same plant, and this fact is of significance, particularly to breeders or in the production of pure seed in view of the pollination of lucerne by those insects which may possibly effect cross-pollination.

Clarke and Fryer[4] have shown that many lucerne plants produce high percentages of sterile pollen grains. There is a possibility that the production of sterile pollen may be environmental as well as inherent, but in either case sterile pollen lessens the chances of seed setting from self-fertilisation, and emphasises the importance of the rôle played by insects or other agencies in cross-fertilisation.

Artificial Tripping.

Piper[6] found that when lucerne flowers were enclosed in cloth bags and not tripped by hand or insects only 5.5 per cent. formed seed pods, and that 30.68 per cent. developed when tripped artificially. The former low per centage was thought to be due to the exclusion of insects which, he stated, were important agents in tripping lucerne flowers. From his own experiment in removing the covers and from his explanation of the cause of increased tripping thereon, however, it seems that the maintenance of turgidity in the lucerne flowers under cover is not conducive to tripping, and that when the cover is removed the decreased humidity removes the turgidity and causes tripping. Southworth[7] increased the percentage of flowers forming seed pods from 12.8 to 46.5 by tripping the flowers under cover. Similar results were obtained in individual plants at Bathurst wholly covered with cheese cloth frames or with the flower racemes covered with glassine bags. Breeders must therefore be prepared to effect artificial tripping in lucerne flowers in order to ensure a good setting of seed in covered plants Any force which gives sufficient pressure on the keel, either laterally or vertically, will trip the flower. The best and quickest method has been found by the writer at Bathurst to be a gentle upward stroking pressure on the flowers. This tripping can be effected on racemes covered with glassine bags without the removal of the bags

Piper[6] found that 16.76 per cent. of lucerne flowers set pods when developed naturally and 30.68 per cent. when tripped artificially. Southworth[7] increased this percentage from 26.4 to 46.8, Hay[6] from 5.94 to 9.48 and Carlson [8] from 24.2 to 58.6 In Carlson's investigations he found that the percentage increased from 39.1 to 65.8 in a very favourable seed year and from 10.1 to 43.0 in a very unfavourable seed year. Artificial tripping of lucerne flowers thus apparently increases the seed setting.

Artifically induced wind or wind of gale force has been shown to have little or no effect in promoting tripping, but it is not known what effect a sudden jarring of the plants would have in this respect. The development of some simple type of machine for promoting the tripping of lucerne flowers and thus for ensuring an increased setting of seed is said to be under investigation in America.

Relation of Seed Setting to Lucerne Improvement.

The improvement of lucerne by breeding and selection methods is being undertaken by this Department at coastal, tableland and western experiment farms, with the object of evolving superior strains of lucerne for these districts. In some of these districts lucerne seed does not set well under natural conditions, but in all the districts it is found that some individual plants set seed much better than others. Whether it will be possible to evolve a strain of lucerne which will be of superior vegetative growth as well as produce seed readily yet remains to be seen.

Preliminary observations indicate that there appears to be a marked positive correlation between a sparse vegetative development and good seed production in individual plants. In an ordinary field of lucerne the greatest quantity of seed comes from those plants of the poorest fodder type. A progressive deterioration in fodder production thus takes place with every generation, when no attempt at selection for improvement is made. This, probably, has been the position in most countries. The fact that lucerne fields have been established for twenty or thirty years or more on rich alluvial soils in our seed-producing districts in New South Wales perhaps largely explains the superiority in fodder production of our local strains by comparison with varieties of strains of lucerne introduced from other countries. There is, however, a tendency in our lucerne seed-producing districts to shorten the life of lucerne stands, and as this will create generations of lucerne seed more quickly than has been the case up to the present, and since deterioration in fodder value will follow this more quickly, selection work for improvement has apparently only been commenced in time.

In those districts in which seed setting in lucerne is in general very poor, there are to be found some individual plants which set seed freely. If these are good fodder types, and if the characters of good seed and fodder production can be fixed by selection in self-fertilised lines, there will be good prospects for evolving superior strains or types of lucerne for these districts from locally-raised seed.

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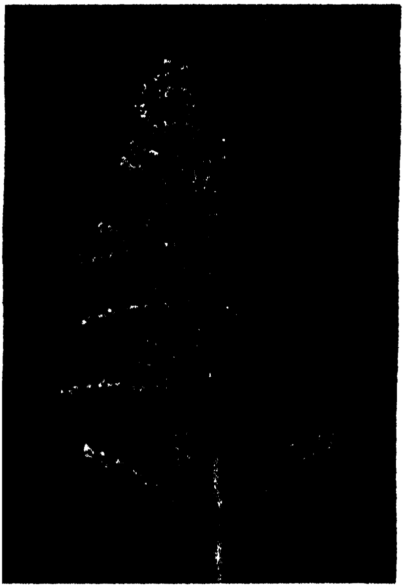
Sweet Sorghum Varieties.

W. H. DARRAGH, B.Sc.Agr., Assistant Plant Breeder.

SORGHUM is an important green fodder crop used for the production of summer, autumn, or early winter feed, chiefly in coastal districts. Being more resistant to frost than maize, and also capable of producing satisfactory crops on second-class land, sorghum is grown quite extensively on the coast and to some extent on the tablelands. On the coast the later-maturing, high-yielding varieties can be grown to perfection, but in the cooler districts it is necessary to use the early-maturing varieties.



Early Amber Cane.

Oxley.

The Two Sorghum Groups.

Sorghum, which is botanically known as *Andropogon sorghum,* is closely related to broom corn millet, Sudan grass, and Johnson grass, with which it will cross readily, and for this reason it must not be grown near these crops, but if, of necessity, this is done, then the crops must be sown at different times.

There are two very different groups of sorghums, viz.:—

(*a*) Sweet sorghums, which are tall-growing plants containing a high quantity of sweet juices in the stalk.

(*b*) Grain sorghums, which are very pithy in the stem, containing no juice, but producing a close, compact head with a high proportion of grain.

It is the purpose of this article to describe the varieties of sweet sorghum that are being grown in New South Wales at the present time, and to provide growers with a means of identifying the variety or varieties they are growing. In some cases farmers casually refer to sorghum as "imphi" or "saccaline," and have no knowledge of varieites. It is desirable that farmers should adopt the name "sorghum" for the crop in general, and refer to each variety by its specific name.

Meanings of the Descriptive Terms Used.

To distinguish sorghum varieties the farmer must make himself familiar with the parts of the sorghum head, or panicle, and of the spikelet, the latter being a part of the inflorescence or flower that is enclosed by glumes or outer chaff.

A few technical terms are used in the descriptions, and their meanings are as follows:—

The term *peduncle* refers to the uppermost portion of the stalk, and it ends with the *panicle* or head. Where the peduncle forms the head it is known as the *panicle axis*, and in many cases it is quite long and extends nearly the whole length of the panicle, while in others it is very short.

The *glumes* comprise the chaff which enclose the grain. In most cases the predominant colour of the head is due to the colour of the glumes.

The *nodes* are the joints which occur on the stem. In some varieties the node is green, whilst in others it has a decided band of pink colour.

The *awn* is a bristle-like structure close to the end of the glume.

The term *ovate* applies to those forms whose greatest width is below their mid point; an *elliptic* form has its greatest width at the mid point, and an *obovate* form has the greatest width above the mid point.

Descriptions of Varieties Grown.

At the present time the following are the varieties listed by local seedsmen and grown in New South Wales:—

Early.	*Mid-season.*	*Late.*
Early Amber Cane.	Honey.	White African.
Oxley.	Saccaline.	Gooseneck.
	Sumac.	
	Cowper.	
	Planter's Friend.	

A variety known as Black sorghum or *Sorghum saccharatum* has been supplanted by better varieties.

The following descriptions apply to these varieties:—

EARLY AMBER CANE.

Stalk of moderate height and thickness, node pink.

Head long and comparatively large, spreading, conical in form.

Glumes large, elliptic, black, pubescent, almost enclosing grain.

Sterile spikelet of moderate size.

Grain medium large, brown, elliptic to ovate, not freed from glumes on threshing.

Maturity early.

OXLEY.

Stalk of moderate height and thickness, node pink.

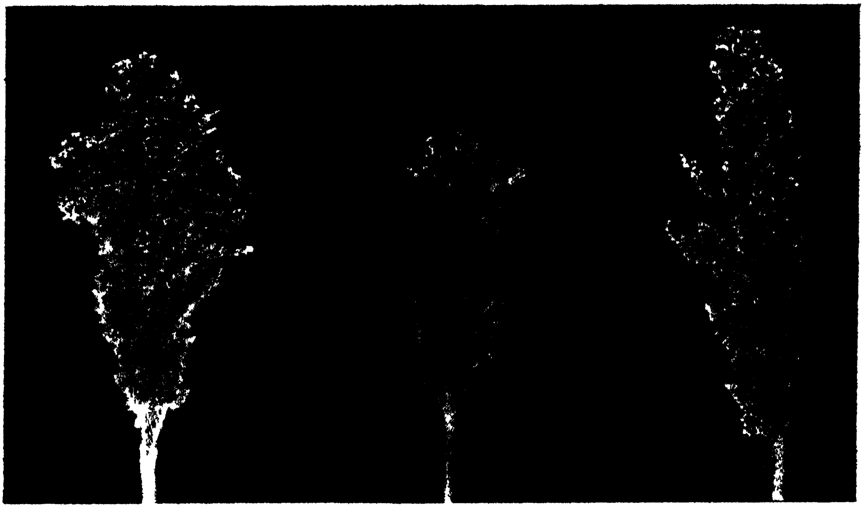
Head long, broad, conical, open.

Glumes comparatively large, elliptic, sometimes reddish but usually black, pubescent, completely enclosing grain, awns not persistent.

Sterile spikelet of moderate size.

Grain medium large, yellow, ovate to elliptic, not freed from glumes on threshing.

Maturity early, but a little later than Early Amber Cane.



Planter's Friend. **Sumac.** **Cowper.**

COWPER (a selection from Planter's Friend).

Stalk tall, of moderate thickness, node green.

Head long, semi-compact, cylindrical.

Glumes comparatively large, elliptic, dark red, pubescent, awnless, not well enclosing grain.

Sterile spikelet large.

Grain medium large, yellow, ovate to elliptic, not freed from glumes on threshing.

Maturity mid-season.

PLANTER'S FRIEND.

Stalk tall, of moderate thickness, node pink.

Head usually long, compact, and fairly cylindrical.

Glumes large, ovate to elliptic, light reddish, moderately pubescent, awnless, not well enclosing grain.

Sterile spikelet large and prominent.

Grain medium large, yellowish-brown, elliptic to ovate, largely freed from glumes on threshing.

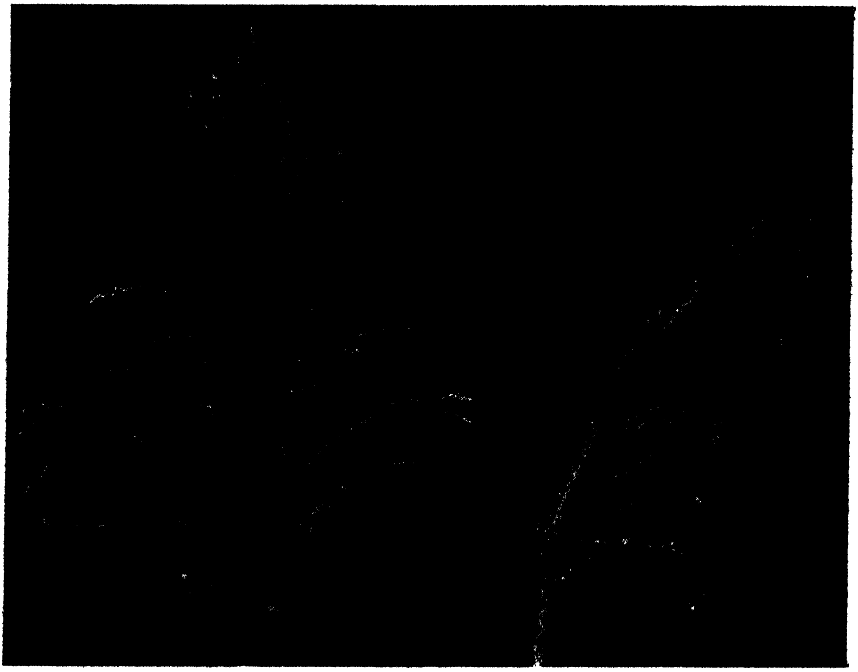
Maturity mid-season.

HONEY.

Stalk of moderate to tall height, moderate thickness.

Head long, very large, very open and spreading, conical.

Glumes large, elliptic to obovate, reddish to light brown in colour, lightly pubescent, awned, enclosing grain.



Honey. **Saccaline.**

Sterile spikelet large and prominent.

Grain medium large, light reddish to yellowish-brown, elliptic to obovate, not freed from glumes on threshing.

Maturity mid-season.

SACCALINE.

Stalk tall, of moderate thickness, node green.

Head long, medium large, semi-spreading, conical.

Glumes of moderate size, elliptic, black, pubescent on upper part of first glume, awnless, only partially enclosing grain.

Sterile spikelet of moderate size, but prominent.

Grain moderately large, yellowish-brown, elliptic, mostly separates from glumes on threshing.

SUMAC.

Stalk tall, of moderate thickness, node pink

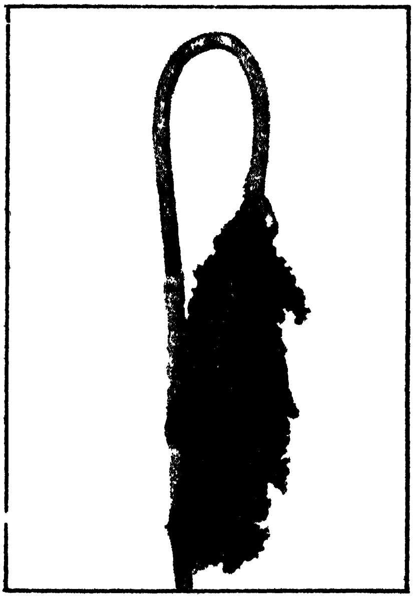
Head short, small, compact, cylindrical

Glumes small, obovate, reddish-brown, pubescent, awnless, only partially enclosing grain.

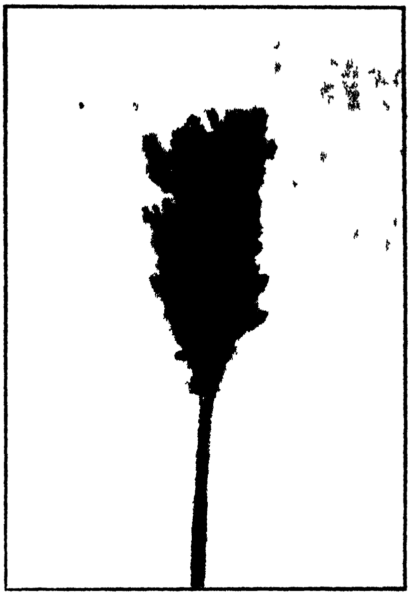
Sterile spikelet large

Grain small, reddish-brown, obovate, nearly spherical, mostly separates from glumes on threshing

Maturity mid-season



Gooseneck.



White African.

GOOSENECK.

Stalk tall, of moderate thickness, node pink.

Head short, of moderate size, conical, spreading, but the recurved panicle gives a close and compact appearance.

Glumes large, obovate, black, pubescent, awned, almost enclosing grain.

Sterile spikelet large.

Grain large, brown, broadly elliptic to obovate, nearly spherical, does not separate from glumes on threshing.

Maturity late.

WHITE AFRICAN.

Stalk tall, thick, node green.

Head medium long, of moderate size, compact, conical.

Glumes large, elliptic to ovate elliptic, black, pubescent, awnless, only partially enclosing grain.

Sterile spikelet large.

Grain medium, white, obovate to elliptic, mostly separates from glumes on threshing.

Maturity late.

A Key to Sweet Sorghum Varieties.

Seed colour, white	White African.
Seed colour, dark red brown, seed small, well exserted from glumes, head compact	Sumac.
Seed colour, light yellow brown—	
Glumes black—	
Seed more than half exserted from glumes, head semi-spreading, nodes of plant green	Saccaline.
Seed somewhat exserted from glumes, nodes pink.	
Heads recurved, compact, awns not persistent	Gooseneck.
Heads erect, open	Early Amber Cane.
Seed wholly covered by glumes, heads open, awns not persistent, nodes of plant pink	Oxley.
Glumes red—	
Seed somewhat exserted from glumes.	
Glumes mostly freed from seed on threshing, light red glumes, compact head, nodes of plant pink	Planter's Friend.
Glumes adherent to seed after threshing, dark red glumes, semi-compact head, nodes of plant green	Cowper.
Seed wholly covered by glumes, heads very open, very large	Honey.

At the present time a large number of introduced varieties of sorghum are being tested on the various experiment farms of the Department, but only those that prove themselves to be better than the existing varieties will be distributed.

Selecting Seed on the Farm.

Very few farmers are aware of the practical benefits to be derived from selecting their own seed.

Though sorghum is largely a self-fertilised crop, crossing has been estimated at from 2 to 5 per cent. It is therefore desirable that growers should confine themselves to one variety and so maintain a reasonable amount of purity.

Seed for the next season's crop should be selected from the centre of the crop and from plants that are true to type. If birds are troublesome, bagging of the heads in thin butter-muslin bags or even brown paper bags will prove an effective means of securing seed. Forty to fifty heads of such varieties as Sumac, Saccaline, or White African will yield about 5 lb. of seed.

Malignant Oedema in Sheep.

H. G. BELSCHNER, B.V.Sc., District Veterinary Officer.

MALIGNANT oedema is an acute febrile infectious disease caused by a wound becoming infected with a specific bacillus of that name. Like the tetanus bacillus, this organism is widely distributed over the surface of the earth, but is more commonly found in cultivated land, in old sheep yards, stock yards, and dirty shearing sheds. It is also to be found in the intestines of herbivora, and may be obtained from their faeces. All animals, including man, are subject to infection; the sheep is readily infected. Malignant oedema in sheep is a common cause of mortality after shearing and lamb marking, the trouble frequently being confused with tetanus. Death usually occurs within forty-eight hours from time of inoculation with the bacillus, whereas mortality from tetanus does not, as a rule, take place so soon.

Cause.

The disease is produced only by the organism gaining entrance to a wound. The wounds caused by shearing, tailing, and castration, especially when carried out in dirty yards and shearing sheds, are particularly liable to become infected. The organisms may be ingested by animals when feeding, and live and multiply in the bowels without causing any ill effects. They are later passed out in the droppings, and subsequently form spores which are very resistant to adverse conditions. In the form of spores the germs live in the filth. Later, these spores are carried with the dust on to wounds, and so infection occurs. This particular germ, like some others, is more at home when the oxygen of the air is excluded, or partially excluded, from the wound. Hence deep cuts or wounds, and particularly the wounds of castration, are more likely to become infected. When favourably situated in a wound the organism of malignant oedema elaborates a toxin or poison which produces the typical symptoms and ultimate death of the animal.

Symptoms.

The symptoms of the disease in sheep are not usually observed by the owner. Generally the first intimation of any trouble is the discovery, some thirty-six to forty-eight hours after tailing, castration, or shearing, of dead sheep in various parts of the paddock. The mortality will probably continue for three or four days, when the disease usually ceases.

In the early stages the animal appears listless and disinclined to move about, and seeks the shade; there is high temperature, up to 106 to 107 deg. Fahr.; breathing is accelerated, and if the animal is forced to move, the hind legs are drawn forward with a peculiar stiff dragging motion.

A soft, doughy and painful swelling develops around the infected wound, which may be anywhere on the body, and spreads beneath the skin. Gas is formed, and the swelling will later crackle on pressure. The swellings extend to the more pendant parts along the belly to the chest and down the thighs, and become dark red in colour. In the open wound a foul-smelling liquid and frothy discharge are observed. The sheep soon goes down and lies on the ground in a state of sheer exhaustion. Death usually occurs within forty-eight hours from time of infection.

Treatment.

Treatment of this disease is practically useless. Most cases are fatal. Sometimes a sheep will recover, more particularly if the infection has occurred on the lower parts of the legs, as such situations are not favourable for the spread of the swelling. In the case of valuable stud sheep, and where the animal is observed in time, an attempt may be made to treat the case by cutting freely into the swelling and applying hydrogen peroxide (one part to three parts of water) or a 5 per cent. solution of carbolic acid.

Prevention.

Preventive measures are the only satisfactory means of dealing with this disease. The disinfection of all wounds will assist in preventing the disease from developing, but it is more important still to prevent the wounds from becoming infected, if possible. This can only be done by taking all possible precautionary measures at shearing time and during lamb marking. The shearing shed should be thoroughly cleaned up and washed out with a hot solution of washing soda and carbolic sheep dip or other antiseptic solution, and the hand-pieces of shearing machines sterilised before shearing commences. Yards should be cleaned up and watered to keep down the dust. If these are very dirty it is advisable to remove from 4 to 6 inches of the surface soil and then spread quicklime over the ground. Special attention should be paid to the counting-out pens.

Before lamb marking commences, all knives and other instruments to be used should be thoroughly boiled, and an antiseptic solution prepared and kept handy in the yards to dip the instruments in from time to time. Lambs should not be marked in old yards if it is at all possible to avoid it. It is advisable, when practicable, to erect temporary yards in the paddock and to carry out the work in these.

In addition to the above precautionary measures it is recommended that after the operations of tailing and castration the wounds be smeared with tar or dressed with carbolic oil (one part of carbolic acid to twelve parts of oil) or other similar antiseptic dressing. During shearing operations some disinfectant that can be applied to shearing cuts should be kept handy. Finally, all carcases of animals which have died from malignant oedema should be destroyed by burning, or buried deeply and covered with quicklime.

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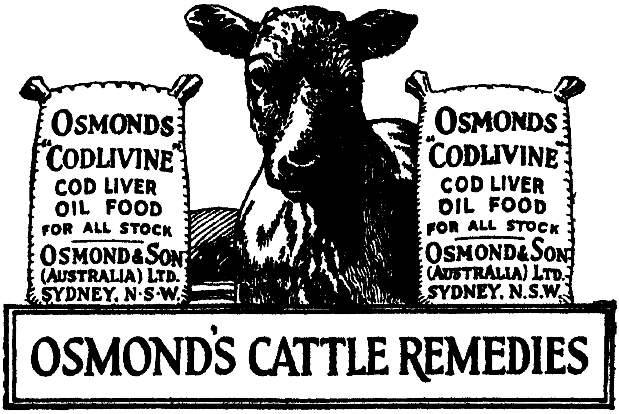

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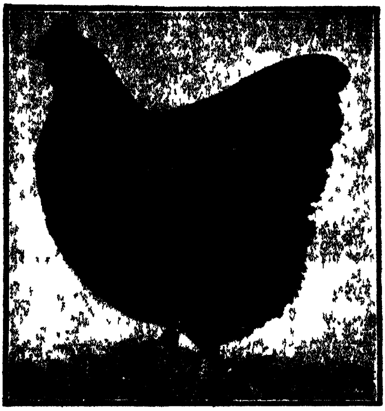

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G. D. ROSS, Under Secretary,
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SYDNEY.

Licks for Stock.

C. BLUMER, B.V.Sc., District Veterinary Officer (North).

MOST stockowners are in the habit of providing some kind of lick for their stock, but it is safe to say that relatively few of them are fully aware of the chief requirements of such a lick and of the best and cheapest manner of supplying the essential ingredients. Many have adopted an empirical formula, which actually supplies very few, if any, essential constituents. Others purchase proprietary mixtures at relatively high cost, and while the results are in some cases good, the price actually paid is out of proportion to the gain obtained. The object of this article is to assist stockowners in solving this lick question in the most economical manner.

It is imperative to realise that a stock lick is primarily intended to supply those minerals essential for growth and production which are lacking in the soil and consequently in the grasses, &c., growing thereon, from which the animals obtain their food supply. It is absolutely impossible for any animals on a diet poor in essential minerals to make normal growth or to be capable of normal production, whether it be flesh, wool, or milk.

The Importance of Minerals.

The minerals commonly found to be deficient in pastures are phosphorus (in the form of phosphoric acid) and calcium (in the form of lime). These two minerals enter very largely in the composition of bones, hence young animals developing their skeletons require greater amounts of these minerals than adults. Similarly the pregnant female requires large amounts of these minerals in order to supply the needs of her own body, and also to build the skeleton of the growing foetus. Milk contains .75 per cent. ash, and of this 70.5 per cent. consists of calcium and phosphorous compounds, totalling approximately .53 per cent. of the milk. As the dairy cow is in the majority of cases both pregnant and milking at the same time, the amount of minerals required by her is greatly in excess of that sufficient for a steer or other adult which requires only sufficient to replace body waste. A further example of the amount of minerals required by an animal is the fact that about 4 per cent. of the body weight of a fat ox is made up of minerals, and of this 40 per cent. is phosphoric acid and 44.6 per cent. lime.

Calcium and phosphorus are both very important elements for the proper functioning of the body. Both are absolutely essential for bone formation. Calcium plays an important part in controlling the clotting of blood, in regulating the heart's action, determining the firmness of muscle, in assisting the digestion of fat, and controlling the action of other minerals on the body. Phorphorus is essential for the building up of all tissues of the body, and without it the supply of wool, milk and flesh would be impossible. Deficiency of calcium and phosphorus results in stunted growth, poor carcases, low production, and weak constitution.

Our Soils are Generally Deficient in Phosphorus and Calcium.

The great bulk of soils throughout the State are deficient in phosphorus and calcium, particularly after they have been used for grazing for long periods. If the soil is deficient in these minerals, the plants growing upon it are likewise deficient. It is evident, therefore, that in order to obtain the maximum results this deficiency must be rectified. Probably the best method of accomplishing this is by top-dressing the pastures with fertiliser, but a discussion of this subject does not come within the scope of this article. Next in importance to top-dressing is the supply of an adequate mineral lick, that is to say, a lick containing large amounts of these two minerals—phosphorus and calcium. Some owners have adopted the practice of supplying a lick containing superphosphate, which certainly supplies these two essentials, but superphosphate is a crude product containing many impurities which are liable to cause disorders of the stomach and intestines if partaken of in large amounts or over long periods. The best method of supplying phosphorus and calcium is in the form of sterilised bone meal, which is a form of calcium phosphate. This is the product of ground-up sterilised bones obtained from animals slaughtered for human consumption, and it naturally contains all the minerals present in the animal's skeleton. Nauru or Ocean Island phosphate is another means of supplying these minerals, but the phosphorus is in a more insoluble form than is the case in bone meal, and is therefore not as readily available to the stock.

Phosphorus and Calcium Content Determines Value of Lick.

If deficiency of phosphorus and calcium exists in a diet the animals develop a craving for these elements, and if these are supplied (in the form of bone meal) they will partake of them only in sufficient quantities to satisfy their body requirements. It is evident, therefore, that the value of a lick depends upon the amount of phosphorus and calcium it contains. Unfortunately, there is no legislation in New South Wales to enforce the manufacturers of licks to disclose the amount of phosphoric acid present in their products. Such legislation is in force in Queensland, and in that State it is necessary for the minimum amount of phosphoric acid and the maximum amount of salt to be shown on each package. Perusal of the figures of the licks sold in Queensland makes very interesting reading. It is seen, for instance, that the amount of phosphoric acid varies from nothing to 24 per cent., whilst the salt content may rise to 97 per cent. No definite brands can be mentioned, but a comparison between the phosphoric-acid content of bone meal and that of a well-known and widely-advertised lick reveals the astounding superiority of the former. Bone meal contains from 24 to 28 per cent. phosphoric acid, while the lick referred to contains only 8.4 per cent. phosphoric acid. In other words, bone meal contains, roughly, eight times the amount of phosphoric acid, although both cost approximately the same. Which is the better value? It means that stock would be required to eat eight times the amount of the proprietary lick to obtain the same amount of phosphoric acid that is in bone meal.

It is important to note that there appears a definite relationship between the phosphate content of grasses and the stage of growth of the grass. This is highest in the young green shoots and lowest in old dry growth. This would account largely for the heavy consumption of lick in the winter months when growth is usually at a standstill. These facts were strikingly borne out in recent field test made in the Tenterfield district, where during the test rain fell (in summer), resulting in a green shoot and consumption of lick decreased considerably.

The addition of iodine to a lick is in the majority of cases unnecessary, and, furthermore, increases the cost of the lick enormously. Unfortunately, stockowners have indiscriminately used iodised licks in many cases where they were not indicated.

Supply Bone Meal and Salt Separately.

It is recommended that owners should adopt the practice of supplying pure bone meal to their stock. Salt, which is also essential, should also be supplied, but in a separate container to the bone meal. The animals themselves will then be able to choose as to the amount of either they will consume, and in this regard be it understood that the animal is a better judge as to what it requires than is man, who endeavours to compound a suitable mixture, often at the expense of the animal and his own pocket. Stock which have been accustomed to being fed a lick containing salt may, for a few days, require to be enticed to partake of the pure bone meal, and this can be accomplished by mixing a small amount of salt with a small amount of bone meal. Whether rock salt or coarse salt is used is immaterial, and in this connection it is of interest to note that frequently small quantities of iodine are present in salt as impurities, and in many cases these small traces of iodine correct any slight iodine deficiency which may exist in the soils.

These remarks are made, notwithstanding the recently-published results of lick trials carried out at Glen Innes Experiment Farm. Stockowners in the New England should not be guided too closely by those results because the soil at that institution is not typical of the bulk of New England country. Furthermore, in the lick trial the sheep were allowed grazing on land which had recently been dressed with artificial fertilisers.

There is special need for stockowners to make a careful and impartial survey of this lick question. No owner can afford to pay high prices for licks with a low phosphate content. There can be no doubt that the provision of bone meal and salt is the most economical and most satisfactory method of rectifying any mineral deficiency which might exist in the feed of the animals.

TUBERCLE-FREE HERDS.

OF the herds which have been tested for tuberculosis by Government Veterinary Officers, or approved veterinary surgeons, in accordance with the requirements of the scheme of certifying tucercle-free herds, the following have been declared "tubercle-free," and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number tested.	Expiry date of this Certification.
Department of Education, Gosford Farm Homes	80	8 Sept., 1931
A. Shaw, Barrington (Milking Shorthorns	122	9 ,, 1931
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	81	12 ,, 1931
E. P. Perry, Nundorah, Parkville (Guernseys)	22	13 ,, 1931
Wagga Experiment Farm (Jerseys)	55	14 ,, 1931
J. F. Dowe, "Woolomol," Tamworth	59	19 ,, 1931
S. L. Wills, Greendale Dairy, Cowra	37	19 ,, 1931
Sacred Heart Convent, Bowral	12	20 ,, 1931
St. Patrick's College, Goulburn	8	22 ,, 1931
A L. Logue, Thornbro, Muswellbrook	40	23 ,, 1931
A. H. Webb, Quarry-road, Ryde	6	26 ,, 1931
James McCormack, Tumut	111	29 ,, 1931
Wolaroi College, Orange	10	4 Oct., 1931
Riverstone Meat Co., Riverstone Meat Works, Riverstone	104	11 ,, 1931
E. S. Cameron, Big Plain, Narrandera	28	14 ,, 1931
J. L. W. Barton, Wallerawang	17	17 ,, 1931
Newington State Hospital and Home	108	24 ,, 1931
J. F. Chaffey, Glen Innes (Ayrshires)	75	4 Nov., 1931
Lunacy Department, Callan Park Mental Hospital	29	13 ,, 1931
J Davies, Puen Buen, Scone (Jerseys)	85	14 ,, 1931
Wollongbar Experiment Farm, Lismore (Guernseys)	129	21 ,, 1931
Tamworth District Hospital	7	24 ,, 1931
Department of Education, Brush Farm, Eastwood	6	9 Dec., 1931
Bathurst Experiment Farm (Jerseys)	21	16 ,, 1931
H. A. Corderoy, Wyuna Park, Comboyne (Guernseys)	59	8 Jan., 1932
New England Girls' Grammar School, Armidale	29	10 ,, 1932
C. J. Parbery, Allawah, Bega	119	10 ,, 1932
New England Experiment Farm, Glen Innes (Ayrshires)	87	12 ,, 1932
W. Spindler, Mt. Pleasant, Bega	66	15 ,, 1932
W. T. Herbert, Racecourse Farm, Bega	68	18 ,, 1932
R. C. Dickson, Elwaton, Castle Hill (Jerseys)	17	20 ,, 1932
Lunacy Department, Morisset Mental Hospital	22	23 ,, 1932
Lidcombe State Hospital and Home	146	11 Feb., 1932
Riverina Welfare Farm, Yanco	77	25 ,, 1932
Department of Education, Yanco Agricultural High School	83	26 ,, 1932
W. M. McLean, Five Islands Road, Unanderra	78	27 ,, 1932
Mittagong Farm Homes	46	3 Mar., 1932
George Rose, Aylmerton	4	4 ,, 1932
Kinross Bros., Minnamurra, Inverell (Guernseys)	66	5 ,, 1932
P. M. Burtenshaw, Killean, Inverell	50	5 ,, 1932
Miss Brennan, Arankamp, Bowral	10	6 ,, 1932
Koyong School, Moss Vale	4	12 ,, 1932
G. A. Parish, Jerseyland, Berry	123	13 ,, 1932
Lunacy Department, Parramatta Mental Hospital	88	16 ,, 1932
Cowra Experiment Farm	32	24 ,, 1932
Hawkesbury Agricultural College (Jerseys)	115	25 ,, 1932
Russell Lamrock, Orange	4	26 ,, 1932
St. Joseph's Convent, Reynold-street, Goulburn	3	26 ,, 1932
St. John's Boys Orphanage, Goulburn	9	26 ,, 1932
Marion Hill Convent of Mercy, Goulburn	9	26 ,, 1932
Lunacy Department, Kenmore Mental Hospital	79	27 ,, 1932
St. Joseph's Girls Orphanage, Kenmore	9	27 ,, 1932
J. P. McQuillan, Bethungra Hotel, Bethungra	14	1 April, 1932
St. Michael's Novitiate, Goulburn	5	26 ,, 1932
James Wilkins, Jerseyville, Muswellbrook	39	28 ,, 1932
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	205	29 ,, 1932
Tudor House School, Moss Vale	8	3 May, 1932
Australian Missionary College, Cooranbong	53	6 ,, 1932
Navua Ltd., Grose Wold, via Richmond (Jerseys)	16	13 ,, 1932
E. C. Nicholson, Jillamatong, Corowa	134	2 June, 1932
Grafton Experiment Farm (Ayrshires)	194	4 ,, 1932
P. Ubrihien, Corridgeree, Bega	133	3 July 1932
St. John's College, Woodlawn, Lismore	21	11 ,, 1932
Gladesville Mental Hospital	40	14 ,, 1932
William Thompson Masonic School, Baulkham Hills	45	16 ,, 1932
W. Hammond, Bellingen	68	16 ,, 1932
Chapman Bros., Farm 166, Stoney Point, Leeton	19	28 ,, 1932
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	13 Aug., 1932

season 1927–2

—MAX HENRY, Veterinary Surgeon.

Black Spot or Scab of Apple.

EXPERIMENTS FOR ITS CONTROL IN NEW SOUTH WALES.

Part II.—The Batlow Experiments.

W. A. BIRMINGHAM, Assistant Biologist, and H. BROADFOOT,
Special Fruit Instructor.

ARRANGEMENTS were made with Mr. C. Buchele, Batlow, in 1925, to conduct experiments to ascertain the most effective spray programme for black spot of apple for that district. The experiments were commenced in October, 1925, and concluded in April, 1930. The variety chosen for the test was Granny Smith, the requisite number of trees of which were placed at the disposal of the Department by Mr. Buchele.

A plot of forty-eight full-bearing trees was selected and divided into nine plots, each containing six trees, with the exception of Plots 1 and 9 (untreated), in each of which there were only three trees. Plot 1 (untreated) was at the top or elevated part of the experimental area, and Plot 9 (untreated) at the bottom. The rows of Granny Smith apples were interspersed with the varieties Yates and Jonathan.

The spray outfit used in the experiment was a 4-h.p. Hardy Mogul No. 12 triplex pump with continuous spray. (See Fig. 5.) The trees were sprayed at 300 lb. pressure with two Hardy spray guns, which give a large volume of spray both as regards height and diameter.

The average quantity of spray applied to the trees was from 3 to 4 gallons. The trees were thoroughly sprayed, and home-made lime-sulphur and Bordeaux mixture were used throughout the experiment.

Spray Programmes.

The spray programmes outlined hereunder show the treatment the individual plots received.

Plot 1.—Control (untreated).

Plot 2.—(*a*) Bordeaux mixture (6–4–40) at "spur-burst" stage.
(*b*) Lime-sulphur (1–14) 26° B. at "pink" stage.
(*c*) Lime-sulphur (1–35) 26° B. at "calyx" stage and subsequently as required.

*Plot 3.—(*a*) Lime-sulphur (1–14) 26° B. at "spur-burst" stage.
(*b*) Lime-sulphur (1–14) 26° B. at "pink" stage.
(*c*) Lime-sulphur (1–35) 26° B. at "calyx" stage and subsequently as required.

Plot 4.—(*a*) Lime-sulphur (1–7) 26° B. at "spur-burst" stage.
(*b*) Lime-sulphur (1–14) 26° B. at "pink" stage.
(*c*) Lime-sulphur (1–35) 26° B. at "calyx" stage and subsequently as required.

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* Prior to these experiments this wa[illegible] [illegible]rtment's recommended spray programme for the control of black spot [illegible]

Plot 5.—(*a*) Bordeaux mixture (6–4–40) at "spur-burst" stage.
(*b*) Bordeaux mixture (6–4–50) at "pink" stage.
(*c*) Bordeaux mixture (6–4–50) at "calyx" stage and subsequently as required.
Plot 6.—(*a*) Lime-sulphur (1–28) 26° B. at "spur-burst" stage.
(*b*) Lime-sulphur (1–28) 26° B. at "pink" stage.
(*c*) Lime-sulphur ((1–70) 26° B. at "calyx" stage and subsequently as required.
Plot 7.—As in Plot 3, but "spur-burst" application omitted.
Plot 8.—As in Plot 3, but "pink" stage spray omitted.
Plot 9.—Control (untreated).

AVERAGE Annual Percentage of Black Spot for Each Plot.

Plot.	No. of trees.	Treatment.	Percentage of Infection.					Average for five years.
			1925–26	1926–27.	1927–28.	1928–29.	1929–30.	
1	3	Unsprayed (Control) ...	32·6	19·1	94·8	52·5	77·1	55.2
9	3	,, ,, ...	56·8	9·9	87·4	84·3	78·9	63·5
2	6	B.M. (6–4–40) at S.B. L.S. (1–14) at P L.S. (1–35) at C.	1.2	0·1	4·5	1·0	0·3	1·4
3	6	L.S. (1–14) at S.B. L.S. (1–14) at P. L.S. (1–35) at C.	1·9	0·1	16·2	1·5	1·1	4·2
4	6	L.S. (1–7) at S.B. L.S. (1–14) at P. L.S. (1-35) at C.	2·0	0·1	14·9	1·3	0·9	3·8
5	6	B.M. (6–4-40) at S.B. B.M. (6–4–50) at P. B.M. (6–4–50) at C.	0·9	0·0	0·8	2·8	0·0	0·9
6	6	L.S. (1–28) at S.B. L.S. (1-28) at P. L.S. (1–70) at C.	3·7	1·2	33·3	3·8	4·1	9·2
7	6	L.S. (1–14) at P. L.S. (1–35) at C.	5·3	20·2	30·5	5·8	1·4	12·6
8	6	L.S. (1–14) at S.B. L.S. (1–35) at C.	9·1	1·9	46·3	20·8	5·1	16·6
*10	3	L.S. (1–14) at G.T. L.S. (1–14) at S.B. L.S. (1–14) at P. L.S. (1–35) at C.	...	...	13·7	...	...	...
*11	3	B.M. (10–5–50) at G.T. B.M. (6–4–40) at S.B. B.M. (6–4–50) at P.	...	...	0·1	...	...	...

NOTE.—L.S. = Lime-sulphur.
G.T. = Green-tip stage.
S.B. = Spur-burst stage.
B.M. = Bordeaux mixture.
P. = Pink stage.
C. = Calyx stage.

* Included in the [illegible] only.

Remarks.

Season 1925-26.—It will be seen from the table that any of the spray programmes results in a considerable decrease in black spot infection and that the programmes adopted for Plots 2 to 5 were generally much better than those in which a spray was omitted or when the lime-sulphur was used at a weaker strength than that used in Plot 3.

In Plot 5 (Bordeaux throughout) 10.4 per cent. of the fruit showed "netted" russetting, and 0.2 per cent. pronounced, roughened russetting.

Hendrick,* referring to Bordeaux injury, states:—

> The amount of injury due to a given species or variety seems to depend (i) upon the specific susceptibility of the plant (ii) upon the solvent properties of cell sap on the copper hydroxide, (iii) upon the permeability of the epidermis of the plant, and (iv) upon the weather conditions following spray. There are many anomalies of occurrence brought about, for the most part, by weather conditions; as damage in some seasons and not in others, in some localities and not in others; some report dry seasons as following injury, others wet: some trees of a variety are injured more than others: the injury is sometimes most severe on the fruit and sometimes on the foliage; the fruit alone of some varieties is immune and of others the foliage; the injury may appear in a few days or may not show for several weeks after spraying; and a weaker mixture may cause greater injury than a stronger one used under similar conditions. . . . . The injured specimens become rough and russetted because of a ruptured epidermis (the outer cellular layer in plants) and the formation of layers of dead, corky cells. . . . . Injured apples do not keep well. Their season in cold storage is not greatly shortened, but when the fruit is exposed to the air the affected parts become mealy and the flesh soft and flabby. Bordeaux mixture has a particularly harmful effect on the apple blossom, killing the tissues of the floral organs.

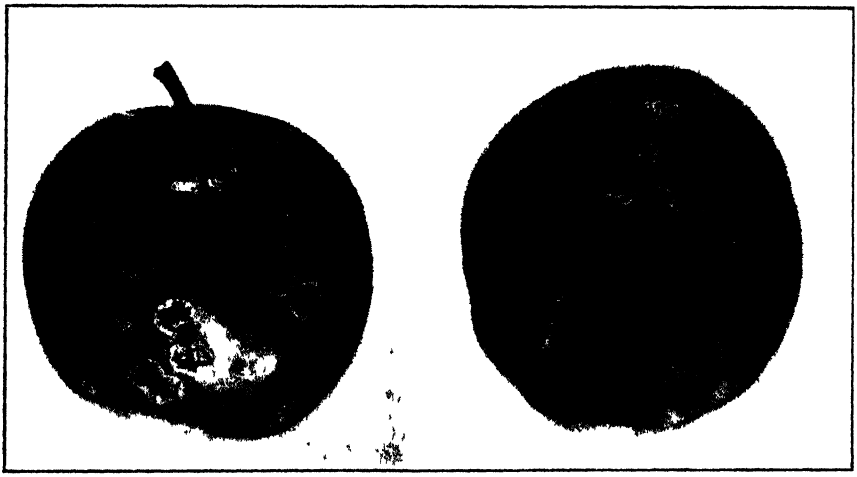

Fig. 1.—Black Spot of Apple.
Left. Average infection Right· Pronounced infection.

The chemistry of Bordeaux mixture, though seemingly simple, is somewhat complex. The compounds formed vary greatly with the proportions of the ingredients used and the conditions under which the mixture is made. The mixture changes greatly under the influence of weather, and especially of moisture in meteoric (atmospheric) form.

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*Hendrick, U. P.—"Bordeaux Injury," Bull. 287, Agr. Expt. Station, New York (Geneva), 1907.

Theories as to the toxic action of Bordeaux mixture may be grouped into two classes:—

1. The mixture is acted upon by the moisture of the atmosphere, and the toxic substances pass through the epidermis with harmful effects.

2. Leaves and fruits secrete fluids which dissolve portions of the copper compound; this finds its way into the cellular tissue, and death results to the cells reached. Bordeaux injury on fruit comes from early spraying after the blossoms have dropped. An experiment . . . . confirmed the opinion of fruitgrowers that wet weather gives the favouring atmospheric condition for this trouble. As far as possible Bordeaux mixture should be used only in dry weather.

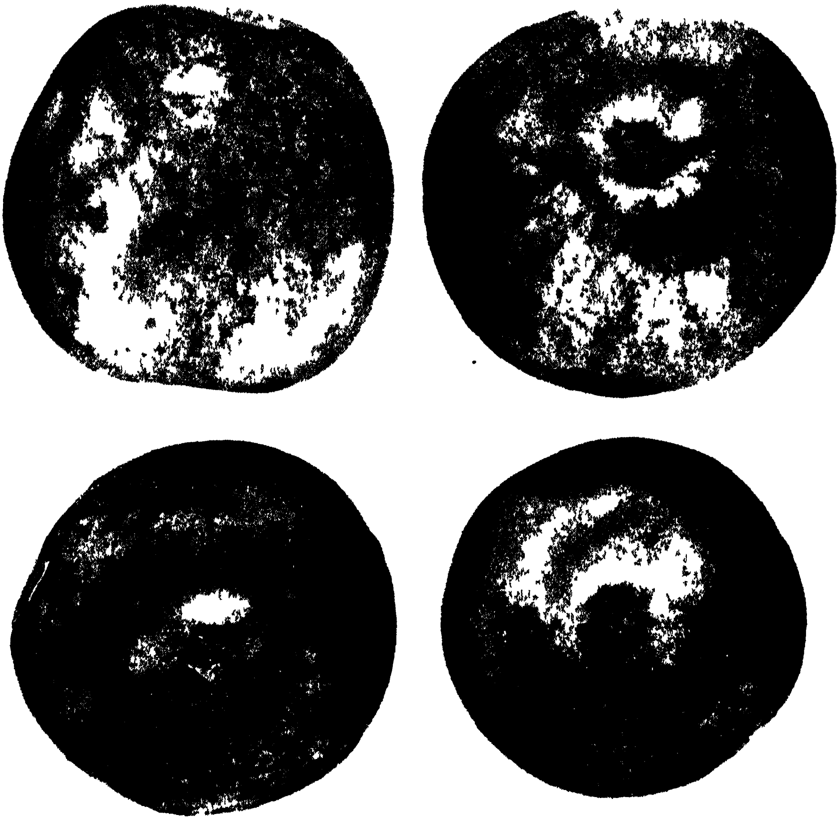

Fig. 2.—Showing Various Stages of Russetting when Bordeaux was used Throughout.

During the season sufficient rain fell before and after the "spur-burst" stage and after the "pink" stage to favour infection, but the percentage of black spot was low in all plots except where the strength of the mixture was lowered or where an application was omitted.

Season 1926-27.—As in the previous season, all of the spray programmes with the exception of that used in Plot 7 considerably decreased the amount of infection, better control being obtained in Plots 2 to 5 than in those where an application was omitted, or when the lime-sulphur was used at a weaker strength than in Plot 3.

An outstanding feature of this season's work was the high percentage of infection in Plot 7, where the "spur-burst" application of lime-sulphur was omitted—the percentage ranging from 9.5 to 26.6, and averaging 20.2 per cent. This might be accounted for by the fact that showery conditions prevailed at the "spur burst" stage, 150 points of rain being recorded on the three days prior to the date on which the "spur-burst" application was made to other plots in the experiment. Slight to pronounced russetting (without cracking) occurred in Plot 5 (Bordeaux throughout).

Weather conditions favoured infection at the "spur-burst" and "pink" stages, but the percentage of black spot was low in all plots except Plot 7, where the "spur-burst" application was omitted.

Season 1927 28—The climatic conditions during this season were conducive to black spot development. The fungus first made its appearance on the foliage and later on the fruit. The control, or unsprayed, trees were very badly infected with black spot, it being difficult to find a healthy leaf on any of these trees, whilst practically all of the fruit was more or less affected with the fungus

The programme followed in Plot 11 (carried out only in 1927-28) gave the best result as far as controlling black spot was concerned, but the difference in the percentage of spotted fruit (0.1) compared with that in Plot 5 (0.8) is negligible, and as the trees received an additional application at "green tip" stage, the extra labour and expense of applying it was not justified. The Bordeaux (10-5-50) applied at "green-tip" stage has a very depressing effect upon the tree, adversely affects the foliage, retards growth, and appears to harden the bark. This Bordeaux formula cannot safely be recommended for apple trees.

The programme followed in Plot 2 appears to be very effective, and although the percentage of black spot was greater than in Plot 5 (Bordeaux throughout), it was so small as to be negligible. The great advantage in using the Plot 2 programme is that there is no danger of russetting the fruit, as there is when Bordeaux is used at the "pink," "calyx," or later stages. The departmental recommendation up to date has been that used in Plot 3. This has given good control compared with the unsprayed trees, but the percentage of black spot in this plot was a good deal more than in plots where a Bordeaux spray or sprays were used.

The plot in which winter-strength lime-sulphur (1-7) was used at "spur-burst" gave slightly better control than when lime sulphur (1-14) was used at this stage, but the difference in the percentage of black spot was not sufficient to justify the extra cost for material.

In Plot 10, where an additional application of lime-sulphur was given at "green-tip" stage, the percentage of black spot was only slightly less than that in Plot 4, where lime-sulphur (winter strength) was used at "spur-burst," followed by lime-sulphur (1-14) at "pink" stage and lime-sulphur-

(1-35) at the "calyx" stage, and on Plot 3, where lime-sulphur (1-14) was used at "spur-burst" and "pink" stages, and lime-sulphur (1-35) at "calyx" stage. The extra spray at "green-tip" stage this season did not appear to justify the extra time and material involved.

Plots 7 and 8, in which applications at "spur-burst" or "pink" stage, respectively, were omitted, showed some control over black spot, but the difference in the percentage of spotted fruit compared with Plots 3 and 4, in which the "spur-burst" and "pink" stage applications were made, is considerable. Plot 6, which was sprayed with lime-sulphur at half-strength, also showed some control over the disease, but the percentage of spotted fruit was high compared with Plots 2 to 5.

It is worthy of note that very little black spot was present on the leaves in any of the sprayed plots.

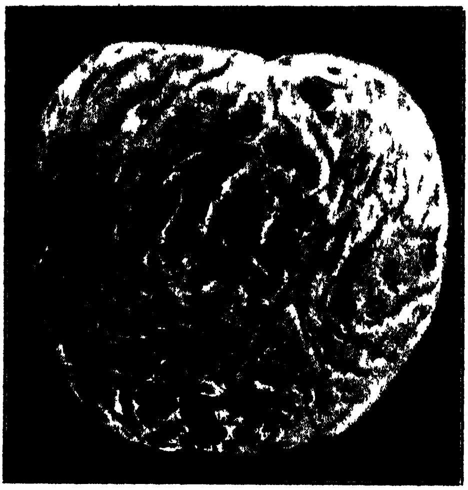

Fig. 8.—Late Infection of Black Spot, showing Characteristic Wilting after Harvesting.

A *late* outbreak of black spot occurred just prior to picking; it developed and spread rapidly. The fruit was harvested in April, 1928, following 686 and 699 points of rain in February and March respectively. It is safe to say that fully 50 per cent. of the apples in the sprayed plots where lime-sulphur was used were affected with "late-spot," which otherwise would have been clean. On the unsprayed trees practically all the fruit showed "old spot" as well as "late spot" marks, and even if there had been no late outbreak of the disease it would not have altered the position very much as far as these plots were concerned. It is noteworthy also that where Bordeaux mixture was used there was practically no "late" infection. This is, in our opinion, a very important point, and was further borne out in the Yetholme district in 1930-31.

One tree in Plot 9 (control) showed a large number of clean apples; this was due to a mistake, half the tree being sprayed with lime-sulphur at the "spur-burst" stage. Sufficient rain fell after the "spur-burst" and before and after the "pink" stage and before the "calyx" stage to favour infection. The effectiveness of Bordeaux at the "spur-burst" stage is demonstrated in Plots 2 and 5. The percentage of black spot was outstanding in the plots where the spray was used in a more dilute form, or where the "spur-burst" or "pink" stage application was omitted, especially the latter (Plot 8).

Season 1928-29.—As in previous seasons, any of the spray programmes resulted in a marked decrease in the amount of black spot, Plots 2 to 5 again being very much better than those in which an application was omitted, or when the spray was used at a weaker strength than that used in Plot 3, although the trees sprayed with Bordeaux mixture throughout (Plot 5) did not stand out as well as in other years. An outstanding feature of this season's results was the high percentage of infection in Plot 8 (20.8 per cent.) as compared with other plots, although not as high as in 1927-28, when infection reached 46.3 per cent.

A record of russetting was not kept, owing to it being so light in character in all plots.

The amount of rain recorded before the "pink" stage and before and after the "calyx" stage favoured infection, the highest percentage of black spot in the sprayed plots being Plot 8, where the "pink" application was omitted.

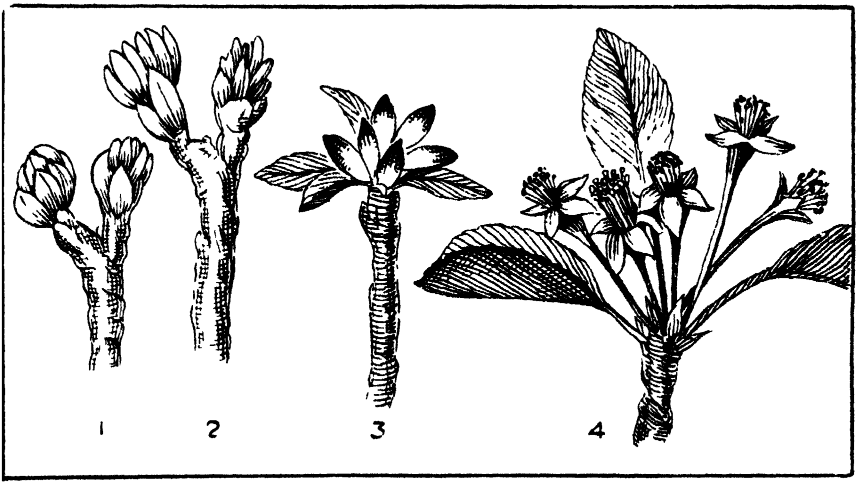

Fig. 4.—Stages in Blossom Development.
1. Green tip. 2. Spur burst 3. Pink 4. Calyx.

Season 1929-30.—In February, 1930, one of the authors (H.B.) reported that excellent results were obtained in the 1929-30 season in the control of black spot. The fruit and leaves on treated trees in the various plots showed practically no black spot, while the fruit and leaves, particularly the former, were badly affected on trees in the unsprayed plots.

The fruit on the trees which received Bordeaux throughout (Plot 5) were very badly russetted, a large percentage being unsaleable. Officers of the Department have always contended that Bordeaux mixture, if applied after the "spur-burst" stage, is very liable to cause russetting in certain seasons. This was, however, the first occasion during the progress of the experiment extending over five years that severe russetting had occurred in Plot 5 (Bordeaux throughout). It is fortunate, in one respect, that russetting did occur in one year, as growers might otherwise have adopted the Bordeaux programme with disastrous results in some seasons.

As in previous seasons any of the spray programmes resulted in a marked decrease in the amount of black spot. The results obtained in Plots 2 to 5 were again much better than those in which an application was omitted or when the spray was used at a weaker strength than in Plot 3, except in the case of Plot 7 ("spur burst" application omitted) where the percentage of infection (1.4) was low. The percentage of black spot in Plot 5 (Bordeaux throughout) was the lowest (0.0 per cent.), but the percentage of russetting (71.7) was very high. The percentage of infection in the control plots (Nos. 1 and 9) indicates that the season was very favourable for the development of black spot. The programmes followed in Plots 2 and 3 gave outstanding results as regards the control of black spot without risk of injury to the fruit. (Fig. 2 shows various stages of russetting from Plot 5—Bordeaux throughout—for the season 1929-30.)

Fig. 5.—Spray Outfit used in the Experiment.

In the 1929-30 season weather conditions favoured infection after the "spur-burst" stage and before the "pink" stage, the highest percentage of infection in the sprayed plots being in Plot 8, where the "pink" stage application was omitted. If the severe russetting in this season can be correlated with the rainfall, it is with the rainfall experienced before the "pink" stage, when 300 points were recorded. Hamilton* has recently shown by greenhouse experiments that sprays containing lime-sulphur,

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* Hamilton, J. M.—"Studies of the fungicidal action of certain dusts and sprays in the control of apple scab." *Phytopath.* vol. 21, p. 445. 1931.

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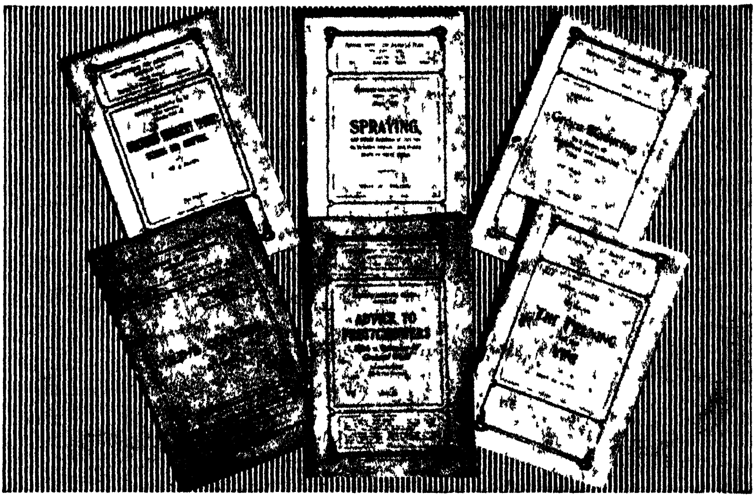

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especially lime-sulphur (1-40) plus arsenate of lead (1-50) give good control when the application is made *after infection periods* ranging from thirty to seventy-two hours, and in some cases longer. Evidence, by means of microscopical examination of the tissues, shows that the scab fungus may be effectively controlled after infection has taken place.

Summary.

An experiment for the control of black spot of apple was commenced in the Batlow district in 1925 and terminated in 1930.

Seven distinct spray programmes were tried during the five-year period.

A programme using Bordeaux throughout gave the best control of black spot, but involves in certain seasons the risk of very severe russetting.

Bordeaux (6-4-40) at "spur burst" stage, followed by lime-sulphur (1-14) at the "pink" stage and lime-sulphur (1-35) at the "calyx" stage and subsequently as required, gave the best control of black spot for the Batlow district without risk of russetting. The average percentage of infection for the five-year period was 1.4.

The average percentages of infection for the control plots (Nos. 1 and 9) over the same period were 55.2 and 63.5, respectively.

In the season 1927-28, when conditions for the development of black spot were very favourable, the percentages of infection for the control Plots 1 and 9 were 94.8 and 87.4, respectively, while in Plot 2 (Bordeaux followed by lime-sulphur) the percentage of infection was 4.5

Based on the results obtained in this experiment, the departmental recommendation for the control of black spot of apple is as follows:—

Bordeaux mixture (6-4-40) at "spur-burst" stage.

Lime-sulphur (1-14) 26 degrees B. at "pink" stage.

Lime-sulphur (1-35) 26 degrees B. at "calyx" stage and subsequently as required.

Acknowledgments.

We desire to extend our thanks to Mr. C. Buchele for his courtesy in placing the trees in this experiment at the disposal of the Department, and also for his hearty co-operation and assistance.

Thanks are also offered to the following officers for valuable assistance given during the conduct of the experiment:—Messrs. W. le Gay Brereton, E. J. Clout, W. W. Cooke, H. J. Hynes, and E. C. Whittaker. We are also indebted to Mr. Whittaker for the meteorological data supplied during the five-year period.

The assistance of Mr. P. R. Maguire in preparing the photographs appearing in this article is greatly appreciated.

Mr. E. H. Zeck very kindly prepared the pen-drawing of Fig. 4.

Orchard Notes.

SEPTEMBER.

C. G. SAVAGE and R. J. BENTON.

DURING the winter months most citrus-producing areas received excessive rainfall, much of which was of such a very heavy nature that it caused the soil to set solid. The conditions also favoured an abundant growth of weeds, and if for any reason ploughing has been delayed, loosening the soil around the trees with a pronged hoe is recommended, otherwise loss of soil moisture is likely to be excessive.

Green Manure Crops.

The autumn was particularly favourable to green crops and weed growth, but later the rainfall was too great for crops like field peas, which were subject to stem decay. The behaviour of this crop, usually so popular with citrus growers, was in marked contrast to previous performances. Apart from the effect of wet seasons on the growth of the field peas, the crop is declining somewhat in popularity owing to its being subject to fusarium, &c.

Lupins were also affected by the excessive rains which retarded their growth in late autumn. Tick beans, particularly on the Irrigation Area, produced a more uniform crop than in previous years, and is the only green manure crop planted extensively on the Area. On the light soils of the coastal division tick beans again failed, but produced a good crop on the heavier loams. The Purple vetch was unaffected by the seasonal conditions and produced abundantly on both heavy and light soils. This vetch greatly benefits light soils, and if seed were available at a lower price it would be more widely utilised.

Fertilisers for Citrus Trees.

It is not too late to apply a quick acting nitrogenous fertiliser, even though the trees may have commenced to grow, and although much of the ploughing may have been completed. The low prices ruling for citrus fruits will perhaps influence numerous growers to neglect to fertilise this year. This omission may do little harm where the trees have not produced a heavy crop during the past season, and provided they are still in good heart and that judicious cultivation has been practised by the grower, but in all other cases nitrogen should be applied.

Though the times demand the practise of economy, if finance is not sufficient to purchase sufficient fertilisers to treat the whole orchard, then do part of the orchard, giving each tree the full quantity recommended. It is not good practice to apply the limited quantity available over the whole area merely with the idea of giving each tree at least some fertiliser.

It is generally agreed that trees up to ten years of age require 1 lb. nitrogen (equal to approximately 5 lb. sulphate of ammonia) per tree, with increasing amounts up to double that quantity as the trees get older.

In light soils, if nitrogen only has been used for the past few years, a dressing of sulphate of potash in addition to the nitrogenous fertiliser is suggested. Recent experiments point to the fact that light soils require the addition of potash every two or three years, otherwise the size of the fruit is reduced. On the coast this year many of the Valencias promise to be small, and some are so backward as to suggest that either (1) adverse cultural or soil moisture conditions early in the season, or (2) excessive soil moisture interfering with the normal functioning of the roots, has been responsible for checking their development.

There is no denying the value of commercial fertilisers, but it is doubtful whether they are preferable to organic manures, such as stable manure, rotted leaves, grass, &c. These are, as a rule, however, difficult to obtain in quantities, but when procurable they should be utilised.

Planting Citrus Trees.

With the risk of severe frosts almost gone and milder days in sight, the work of planting can be undertaken. On receipt of the young trees it is a good idea to grade them according to the diameters of the stems, planting the most backward trees in a row by themselves in order that they might be given additional attention as regards hand watering, shelter, &c.

Prior to planting cut off all the leaves. This will retard transpiration and consequently help the tree to become established more rapidly. After placing the young tree in the hole, spread out the main roots and partly fill in the soil, then give a watering, after which the rest of the soil can be filled in. Be sure to keep the bud union a few inches above the ground level, and protect the stem to within 6 inches of the head by wrapping with several folds of newspaper.

Re-working Unsuitable Varieties.

This is an opportune time to work over unprofitable varieties or strains to more suitable types.

Trees in a weak condition should be fertilised before being re-worked, as failure can often be traced to the low condition of the trees. With the inexperienced grower, re-heading the trees generally proves the most successful method. The trees develop many shoots which may subsequently be thinned and buds inserted, either in December or autumn, depending on the development of the shoots. To the more experienced growers, side grafting in limbs will perhaps suggest itself as effecting a saving of time. In this form of grafting well-developed wood is desirable, and this is prepared by making a long sloping cut to facilitate fitting it into a T-shaped incision in the bark of a main limb. During the process of re-heading, the main limbs and trunk are exposed and should be whitewashed as a protection against sunburn.

Pruning.

It is now the most suitable time to "lift up" any trees which may have large fruit-bearing limbs too near the ground. Such limbs should be cut back to more vertical limbs, but care should be taken not to lift the limbs more than 9 to 12 inches from the ground. Strong-growing limbs in the centre of the tree should be suppressed and a watch kept to see that these undesirable limbs are not replaced by later growth. If so, these new shoots should be cut out before becoming too large.

Some thinning of limbs in Emperor mandarin trees growing in shallow soils is desirable, more particularly in trees likely to bear a heavy crop next season. This will ensure better size in fruit. The removal of dead and spent wood should also be undertaken now, or whenever opportunity offers.

Preparation of Fruit for Export.

Owing to the doubtful prospects of being able to sell fruit locally at profitable prices, some growers are preparing to export part of their crop. While some are putting up their fruit for export in a most attractive manner, others are barely meeting the requirements of the export regulations. These latter individuals fail to realise what an important selling factor is attractiveness. The best buyers will rarely touch the unattractive article, even though the quality of the fruit is good.

Pleading economy as an excuse, some growers are purchasing cases with undressed ends. It is difficult to label or mark on these rough ends, which all tends to make the appearance of the case unattractive, and consequently any saving effected on the purchase of these cases is more than offset by loss in the price obtained for the fruit.

Labels should be thoroughly moistened before being pasted on to the cases, for if applied without prior moistening the paste tends to make the paper stretch, and then on drying it contracts and becomes wrinkled. Allow the labels on the cases to dry before handling, otherwise they are easily torn or made dirty. Aim at neatness in every detail, even in branding the contents on the cases. It seems almost superfluous to add that only the highest quality fruit of the most suitable sizes should be packed for export.

Citrus Diseases.

Growers experiencing trouble from citrus scab, melanose, and exanthema should shortly begin making preparation for treating these diseases. Leaflets giving full details are available on application from the Department.

Powdery Mildew of the Apple.

In the August "Notes" growers were advised to fallow up the cutting out, where possible, of all affected apple twigs with an application of colloidal, atomised or atomic sulphur. Inadvertently, no mention was made of lime-sulphur, which spray has given the best control of powdery mildew in recent trials.

Hints for Banana Growers.

In forwarding some topical hints for banana growers, Mr. H. W. Eastwood, Fruit Instructor, Murwillumbah, points out that more attention could be given by some growers to the problem of combating bunchy top disease. The successful and economical control of bunchy top disease depends on detection of the disease in its earliest stages, and treatment of the affected plants and their suckers with an insecticide prior to their removal and destruction. No grower should lack the necessary information on any of these points, for if he cannot immediately get into touch with his local inspector the information is available in leaflet form from the Department of Agriculture, Box 36A, G.P.O., Sydney. Growers should make themselves thoroughly conversant with the new regulations, which make its compulsory first to destroy the aphids on the plant by spraying with an insecticide and then to dig out the plant and cut it up as prescribed. The pouring of kerosene down the centre of the stem is no longer recognised as an effective method of destroying the plant. Anyone carrying out the regulations with thoroughness will have little difficulty in controlling bunchy top.

Planting Distances.

The idea of planting bananas 10 feet apart each way was perhaps all right when allowance had to be made for loss of stools from bunchy top disease, but Mr. Eastwood now recommends planting 12 feet by 12 feet. Ten by ten planting makes de-suckering a very heavy undertaking, and after the first year of cutting the stools become rather crowded for convenience in carrying out most operations in the plantation. Wider planting enables each stool to get more nourishment, sunlight and air, and facilitates inspection of the plants for detection of disease. The number of bunches per acre will be less, but they should be larger and of better quality, while the wider spacing should lengthen the life of the plantation.

System of Planting.

Bananas are seldom planted other than on the square system. There is no need for any great accuracy in setting out the plantation, as after a few years the stools in even the best laid-out areas get out of alignment. Where it is possible to use a plough, furrows can be made the required distances apart both ways, or if ploughing is possible in only one direction then the measuring stick can be used along the furrows. The combined use of sighting sticks, a measuring stick or tape, and a keen eyesight is the method relied upon on other classes of land.

Before planting, make provision for paths, slide tracks, and roadways. In some case where no provisions have been made along these lines it has been necessary later to root out stools and in other ways go to a lot of extra trouble to make the necessary tracks, &c.

Planting Refills.

To minimise the difficulty of successfully establishing refills amongst mature stools, it is preferable to use an old butt or the corm of a very forward plant with a well-developed eye or peeper sucker. Remove all other eyes or peepers and keep down all subsequent sucker growth until the mother plant is well grown. Treated in this manner and given a little extra care and attention refills have at times yielded bunches just as good and in about the same space of time as the originally planted suckers.

Depth of Planting.

Depth of planting varies with the nature of the soil. In good, deep volcanic soils 15 to 18 inches is not too deep, but where there is a stiff subsoil nearer the surface 10 to 12 inches is deep enough. Dig the hole to the required depth and not less than 12 to 15 inches in diameter. Place a few inches of good top soil in the botton of the hole, then place the bulb in position and cover with surface soil to a depth of 2 or 3 inches. Next break in the sides of the hole to cover the plant another 2 or 3 inches, and then tramp down the soil firmly. On no account should the young plant be covered to the full depth of the hole in which it is planted.

"Heart-rot" in Bananas.

Growers are reminded that the virus disease of bananas known as "heart-rot" has been proclaimed a notifiable disease, and consequently it is now incumbent upon occupiers of any land or premises in which this disease appears to notify in writing either an inspector under the Plant Disease Act or the Under Secretary of the Department of Agriculture within twenty-four hours of discovering or becoming aware of its presence.

TREATMENT OF LAMBS FOR WORMS.

WHEN treating lambs for worms with the mustard and copper sulphate (bluestone) drench recommended by the Department it is advisable to take the age of the animal into consideration. When treating lambs under three months old the standard mixture (4 oz. bluestone, 4 oz. mustard, 1½ gallons water) should be mixed with an equal quantity of water and the lambs given 1 oz. of the diluted mixture.

For drenching lambs stockowners are recommended to use a long but narrow-necked bottle marked to show the limit of the 1 oz. dose, or a drenching tin with a narrow base, so constructed that the overflow hole marking the 1 oz. dose is about 1¼ inches from the bottom of the tin.—MAX HENRY, Chief Veterinary Surgeon.

WRITE to the Department of Agriculture, Box 36A, G.P.O., Sydney, for a copy of its "List of Publications," which contains the titles of nearly 500 leaflets, bulletins, etc., practically all of which are issued free of charge to farmers.

Poultry Notes.

SEPTEMBER, 1931.

E. HADLINGTON, Poultry Expert.

THERE is every indication that during the coming summer there will be a greater glut than usual in the poultry markets unless poultry-farmers take heed and endeavour to rear their cockerels to a marketable age. The fact that hatcheries are unable to meet the demand for chickens, and that there are hundreds of newcomers into the industry, points to a greatly increased number of chickens being reared this season, and if the usual practice of rushing thousands of immature poussins and small grillers on to the market is followed, very low prices will be realised. The manner in which the greater portion of the cockerels are marketed in Sydney is not only a reflection on the industry, but results in an economic loss because, owing to the smallness of the birds and the lack of demand for such birds, prices drop to zero.

The question is often debated as to whether it pays to rear cockerels, particularly Leghorns, to a suitable age for market, but if the rearing and marketing of the birds were carried out in a more systematic manner there is no reason why the majority of cockerels should not be sold at a profit, and thus contribute something towards the cost of rearing the pullets. This is one factor which has an important bearing upon cost of production, and during the next year or two at least, poultry-farmers will need to concentrate upon reducing costs to meet the lower returns which appear to be inevitable.

Study the Market.

It cannot be stated definitely at what age cockerels should be marketed to obtain the best prices, because the class of birds that will command satisfactory prices early in the spring will not do so later, when the market is over-supplied with small birds. It is therefore necessary to watch the market closely and send only the class of poultry that is in demand. However, it may be stated that there is always a shortage of young birds on the market for several months up to the end of October, and during September and October well-grown birds of ten weeks old and over will usually realise payable prices, but birds of the same age a month or so later would meet with glut conditions and be sold at much lower prices. Generally speaking, to obtain satisfactory prices towards the end of the year it is necessary to hold the cockerels until they weigh about 4 lb. or over. It must be understood, however, that it is essential that cockerels be well grown to be profitable at any age, and this is where much improvement could be effected on many farms without any considerable outlay.

Rearing Methods.

Chickens as a rule will do well in small runs up till they are three months old, provided they are properly housed and fed, and are not overcrowded, but after this stage they will continue to develop normally only if given plenty of range. It can be definitely stated that if the birds are well reared up to three months old and are then given ample range they may be marketed direct from the range yards without any "topping off," although when properly handled for fattening extra weight can be obtained, but suitable equipment for fattening involves extra expense and more labour is entailed in management. Moreover, without skilful feeding, the results are disappointing and no advantage is gained.

The Colony System.

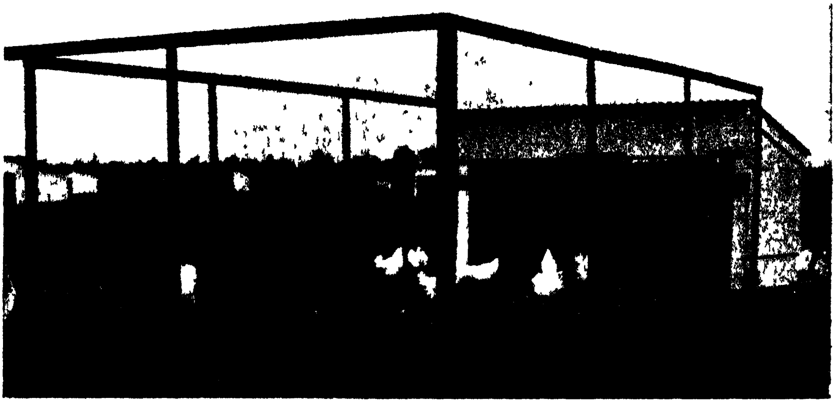
To ensure that the birds are healthy and well grown, the colony system is the soundest that can be adopted for rearing both cockerels and pullets, after they have learned to roost. Wherever this method of rearing has been adopted and worked properly the advantage is apparent in the physique of the stock. The system has been in use on the farms under the control of the Department of Agriculture for many years, and visitors to these farms always comment upon the clean, healthy appearance of the birds. During my tour abroad last year I also observed a marked difference in the health and physique of birds that were reared under suitable free range conditions, which system is extensively adopted in England. In America, however, while the majority of farms visited were equipped with colony accommodation, in many instances the type of houses and the area of land allowed were not conducive to the best results.

Many poultry-farmers here are now beginning to realise the advantages of allowing the growing stock plenty of range after they have learnt to roost, but others attempt to rear the chickens in small bare yards up to the time they are half grown, when they move them into the adult houses, often without having first cleaned up and spelled the pens.

As previously stated, the young stock will develop satisfactorily in small runs up till they are about three months old, but if kept longer than that under such conditions they will lose condition and receive a check in development from which they will not properly recover, while to move them from small pens into adult houses in large numbers is often the cause of outbreaks of catarrh and roup; but even if no disease breaks out the birds do not develop satisfactorily and are therefore not so profitable as layers.

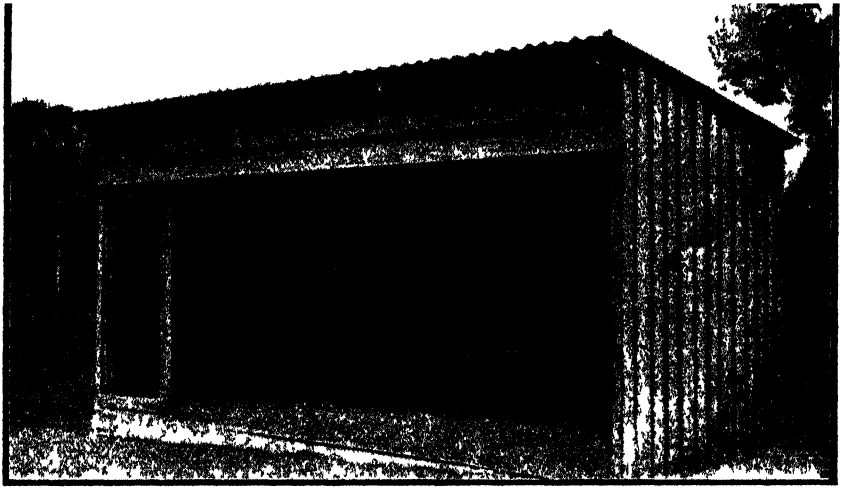
When the young stock are run on ground which has been occupied by adult birds there is always a great risk of their becoming infested with worms. This is also the case when the pens for the young stock are situated in such a position that the drainage from adult pens flows over the ground. For this reason, in laying out a poultry farm the accommodation for young stock should be kept as far away as possible from the adult pens, and should be so placed that the drainage does not affect them.

It is realised that on some farms space will not permit of providing free range for the growing stock, but, on the other hand, there are many cases where ground is lying idle which could at a small cost be utilised for colony yards and houses. The objection may be raised that by spreading the young stock out on free range more labour would be involved in attending to them: but it must be remembered that from three to six small houses can be placed in one large enclosure, the number of houses depending on the number of birds being handled and whether there is any wide variation in their ages. On the average farm three to four houses to each enclosure will be found the most convenient. The mistake should not be made of dividing off the run for each house as is done on some farms, as this defeats the object of the colony system, which is to give all the birds extensive range. There is no necessity to divide off the runs if the system is properly worked. To ensure that the birds do not drift from one house to the other it is necessary to keep them confined in a small yard around the house for about a week after they are first moved into these houses. A small enclosure can be made with three portable frames, the house forming the fourth side, as shown in the accompanying illustration. A suitable size for the frames is 12 feet long by 6 feet high, and for convenience in attending to the birds, each set of frames should be provided with a gate. Several sets of frames will suffice for quite a number of houses, as they can be transferred from house to house as required. If the birds are properly managed in this respect and are not fed close to any one house, there should be no difficulty about getting them to return to their own particular houses at night time, because fowls have a "locality" instinct, and when accustomed to one location will not readily move to another.



An enclosure with portable frames forming three sides, the house forming the fourth.

Other factors are the distance apart of the houses and their arrangement in the yard. It is desirable to space the houses not less than 1 chain apart, preferably further, and if possible they are best placed in irregular lines. A suitable size for the colony houses is 12 feet long by 6 feet wide by 6 feet high in front and 5 feet at the back. This will accommodate fifty birds when they are first put in, but the number should be reduced to about forty-five by the time they are a little more than half grown. It is important that a large area of run be allowed, a minimum of 5,000 square feet for each house, or half an acre to each four houses. The birds may remain in these houses up to the time they come on to lay, or even longer if necessary; but it is essential that the pens be allowed a spell of at least three or four months between each season so that they may become cleaned up and grassed over before the new season's stock are placed in them.



The Style of Colony House at the Government Poultry Farm, Seven Hills.

Dimensions—12 ft. x 6 ft., 6 ft. high in front, 5 ft. high at back. These low houses should be kept clear of fences.

The water supply should be located within reasonable distance of each house, so that in the heat of the summer the birds do not have to go far for a drink.

Specification for Building a Colony House.

The accompanying illustration shows the construction of the house. It will be noted that two perches run the full length of the building, and these should be made of 3-inch by 2-inch hardwood spaced 2 feet apart and 15 inches from the floor, also 15 inches from the back of the house. An aperture of 3 inches should be allowed along the back of the house between the top plate and the roof. The floor should be of concrete of a thickness of 1½ inches., Care should be taken to build the house well above the ground so that there is no danger of surface water flooding the floor.

The materials required for building the house are as follows:—

For top and bottom plates, and for plate to carry weatherboards in front, also for the two roosts	8/12′ 3″ x 2″ hardwood.
For three front and three back studs and fillets for fronts under weatherboards	3/12′ 3″ x 2″ ,,
For the four rafters	2/14′ 3″ x 2″ ,,
For door and roost cleats	3/7′ 3″ x 1″ oregon or hardwood.
Battens for roof	3/12′ 3″ x 1″ ,,
For centre rail to nail palings on to	2/12′ 3″ x 1″ ,,
Weatherboards for front	2/12′ 7″ splayed hardwood weatherboards.
Palings for ends	45/6′ long.
Palings for back	45/5′ long.
Corrugated iron	7 sheets 7′ long (26 gauge).
Guttering	2/6′ lengths of 4″ O.G.
Down pipe	1/6′ length 3″.
Brackets	4/4″ brackets for O.G. gutter.

Galvanised iron may be used for the walls of the building, if desired, but the objection to this is that it makes the houses hotter in the summer and colder in the winter than if built of wood.

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with the view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected orange buds to nurserymen during the 1930 budding season, trees from which should be available for planting during the 1931 planting season:—

	Buds of Washington Navel.	Buds of Late Valencia.
T. Adamson, Ermington...	3,000	3,000
W. Beck, Epping	1,000	1,000
A. T. Eyles, Rydalmere	3,000	2,000
J. de Freitas, Fairfield	200	200
R. Hughes, Ermington	1,000	1,000
L. P. Rosen and Son, Carlingford	5,000	1,200
B. E. Yarnall, Ourimbah	100	100

—C. G. SAVAGE, Director of Fruit Culture.

DURING the past twelve months the following country grain elevators have either been completed or are so far advanced that they will be ready for the next harvest:—Gidginbung (30,000 bushels capacity), Weethalle (90,000 bushels), Erigolia (30,000 bushels), North Gooloogong (30,000 bushels), Woodstock (30,000 bushels), Cunningar (30,000 bushels), Belfrayden (30,000 bushels), Ladysmith (30,000 bushels), Quandary (90,000 bushels).

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—	
Fitzroy	Manager, Experiment Farm, Grafton.
Large Goldmine	P. Short and Sons, "Moore Park," Armidale.
Leaming	Manager, Experiment Farm, Grafton.
Murrumbidgee White	M. Leitch, Bulgary Private Bag, Wagga.
Tomatoes—	
Bonny Best	Manager, Experiment Farm, Bathurst.
Marglobe	Manager, Experiment Farm, Bathurst.
Sweet Potatoes (cuttings only)—	
Vineless	S. Redgrove, Sandhills, Branxton.
Nancy Hall	
Yellow Strassburg	
Porto Rico	
Brooks' Seedling No. 3	
Director	
Pierson	
Sudan Grass	Manager, Experiment Farm, Bathurst. Manager, Experiment Farm, Nyngan.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

A BOOK FOR THE GARDEN LOVER.

WHEN we expressed our high opinion of the twenty-first edition of "The Australian Gardener" in the December, 1929, issue of the *Agricultural Gazette*, little did we think that we would be giving notice so soon to a further edition. For this new edition portions of the previous production have been considerably revised, while other parts have been entirely re-written.

We know of no better local book on flower gardening. In addition, it contains very useful sections on home vegetable gardening and fruit trees.

The publishers, Messrs. Robertson and Mullens, Ltd., Melbourne, have displayed the contents of this well-illustrated work most attractively. Local booksellers are retailing the work at 7s. 9d.

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1st October, 1931.

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VOL. XLII. PART 10. OCTOBER 1, 1931.

Agricultural Gazette of New South Wales.

Thatching Haystacks.

L. JUDD, H.D.A., Manager, Experiment Farm, Temora.

THE loss occasioned by depreciation of hay in unthatched stacks is so great that the industry cannot afford to ignore it, particularly during such times as the present. Costs of production in this country are very high, and wastage in any shape or form amounts to not only a loss of revenue, but also a direct financial loss to the individual to the extent of the cost incurred in growing and stacking the hay. In older countries we see a measure of thriftiness and sound management that could well be imitated by farmers in this State.

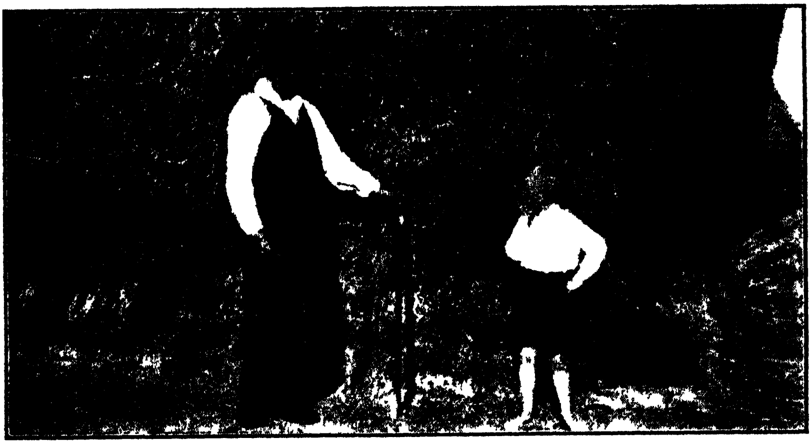

Fig. 1.—Suitable Thatch Peg.
Note the groove where the string is attached.

Suitable Straw the Main Essential.

The main essential in thatching is an ample supply of good, hard, clean straw of suitable length, showing a minimum of flaw. Varieties such as Baroota Wonder, Yandilla King, Wandilla, and Ford, should, if possible, be chosen, while varieties like Currawa, Waratah, Canberra, and other varieties with a short, weak straw should be avoided. Straw showing forced or rank growth is not ideal, as it lacks strength and lasting ability and invariably carries an undue amount of flag. Length is a very desirable feature, as the longer the straw the more weatherproof will be the thatch, while the work of building the thatch is much easier and less pegs are required to hold the straw securely in position.

The practice adopted by many farmers of using a harvester on the section required for thatching-straw is worthy of general adoption. The header is not recommended, as it materially reduces the length of straw.

Thatching-pegs, Binder Twine, &c.

The next essential is a supply of thatching-pegs. The most suitable timber to use, if procurable, is mallee, but failing mallee either pine, box or gum will serve the purpose. Gum suckers are generally to be found in abundance along our inland rivers and can be cheaply gathered. The pegs should be approximately 1 inch in diameter and 2 to 3 feet in length. A suitable thatch peg is shown in Fig. 1.

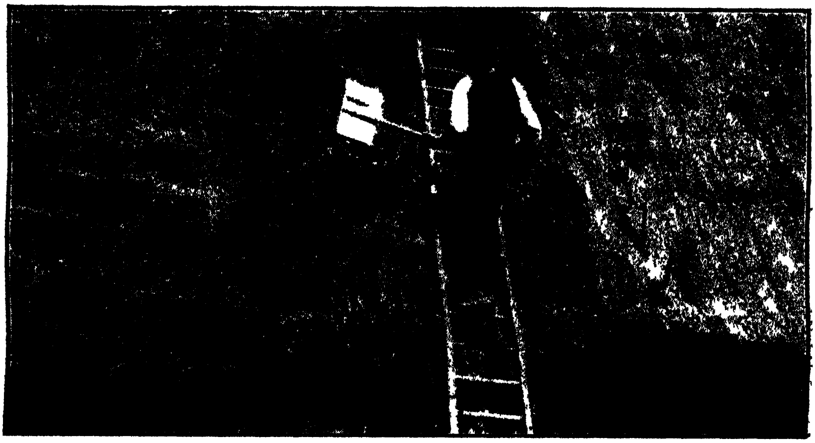

Fig. 2.—Smoothing the Roof with the Bat.

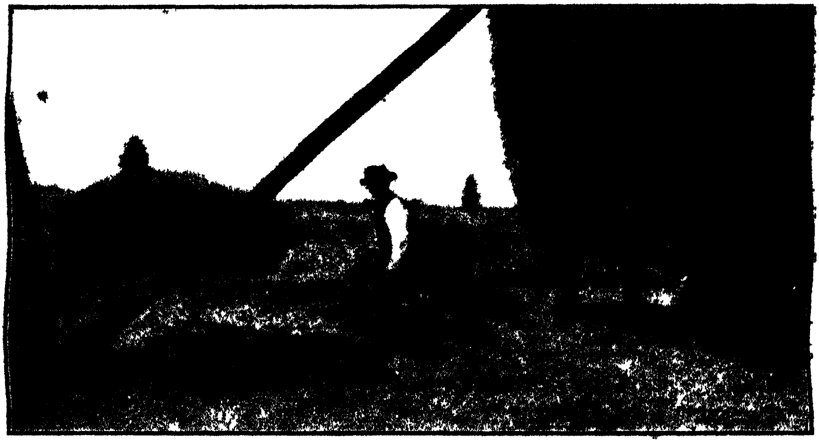

Fig. 3.—Watering Down the Thatch with Water-can.
Note water-cart and supply of thatch straw handy

The number of pegs required varies, of course, with the size of stack and the length of straw used. As a general guide, a stack of 55 feet by 19 feet will require approximately 500 pegs, where medium length straw is used in thatching. It is advisable when the pegs are green to make a groove in the peg about 3 inches from the top, as shown in the illustration. This groove provides a secure hold for the twine and prevents it slipping off the peg and thereby loosening the thatch. The pegs should also be suitably pointed to facilitate their entry into the stack.

Ordinary binder twine is generally used for tying down, but, if available, thin tarred rope is preferable Sufficient twine to run the length of the stack should be tied to and securely wound on to a small peg; if loosely wound round the peg the twine is likely to leave the peg and become tangled, resulting in slower working and loss of time The number of pegs to be wound will depend on the number of rows of twine required to hold the thatch in position, this in turn being controlled by the depth of the roof and the length of the straw used.

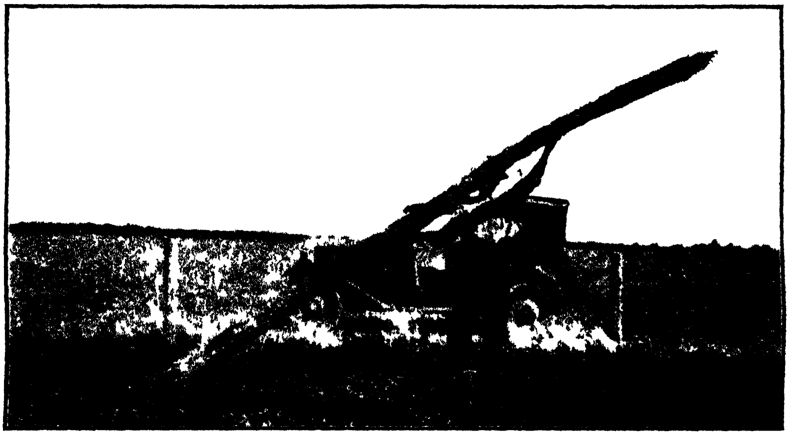

Fig. 4.—Bolster for Ends of Stacks.

Fig. 5.—Putting in Straw to Form False Eave.

Other requirements are a watering-can, rake, bat for smoothing the roof (Fig. 2), water-cart for water supply, suitable ladders, and a pair of shears.

Preparing the Roof of the Stack.

The first operation in thatching is to prepare the roof of the stack by raking off all loose straws and then removing irregularities by the use of the bat (see Fig. 2). Sheaves protruding should be knocked back into position and butts of sheaves sloped, the idea being to leave a smooth, level, and sloping roof for the reception of the thatch. This operation is best done in sections as the work proceeds, thereby lessening the work of moving the ladder. Any hollows present in the roof of the stack should be filled with straw till level with remainder of roof and then thatched over, selecting long pegs to ensure a good hold in the stack.

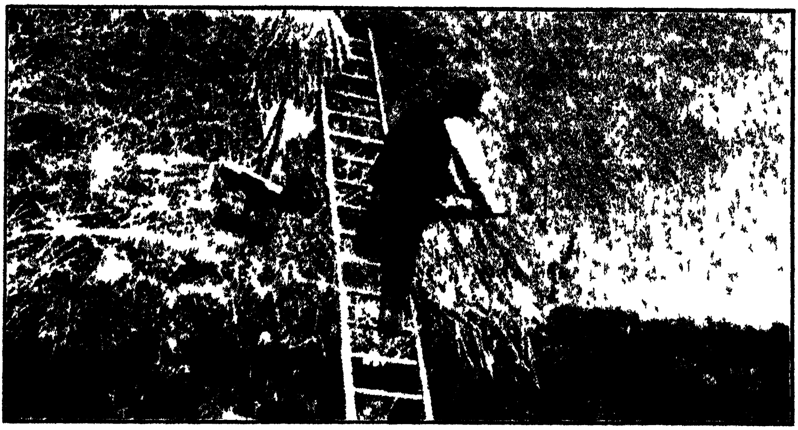

Fig. 6.—Placing Thatch in Position.

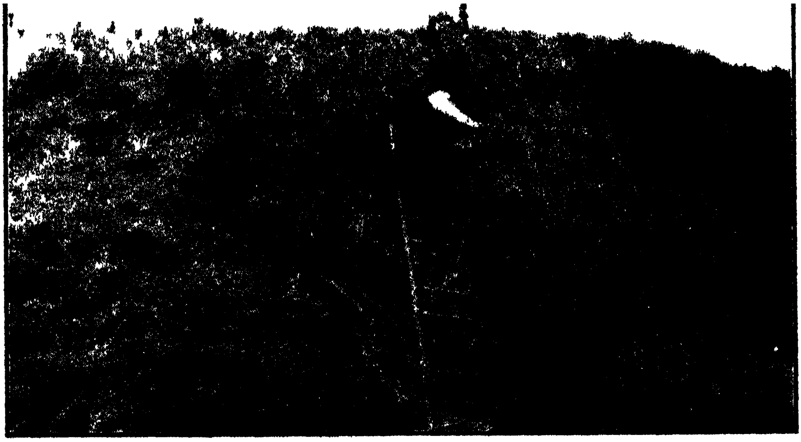

Fig. 7.—Tying Down the Thatch.

Next prepare the thatch straw by neatly setting it out in piles so as to facilitate handling and watering (See Fig. 3) A supply of straw should always be kept watered down in advance so as to allow the water to soak thoroughly into the straw and thus obviate delay

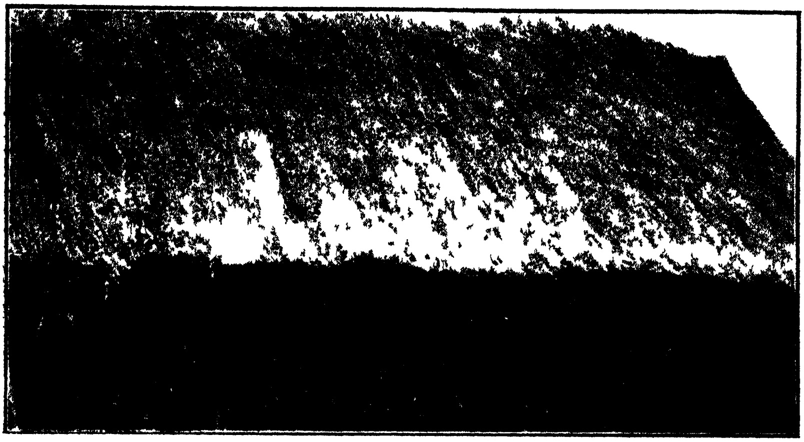

Fig. 8.—Loop tying gives a Smooth Finish to the Thatch.
Note how the finished portion has been neatly trimmed

Fig. 9.—Showing Bolster in Position along Ridge of Lucerne Stack.

The Starting Point.

The method of starting a thatch will depend upon the type of stack. In thatching, the main point is to guard against leaving any opening by which wind may get under the thatch. Once this happens, no matter how securely the thatch is tied down, it is only a matter of time before it will leave the stack.

When thatching a square-cornered stack, first prepare a "bolster" as shown in Fig. 4, and lay it right up to the edge of the stack, securely spiking it in position with pegs, as well as tying it to the bands of the roof sheaves.

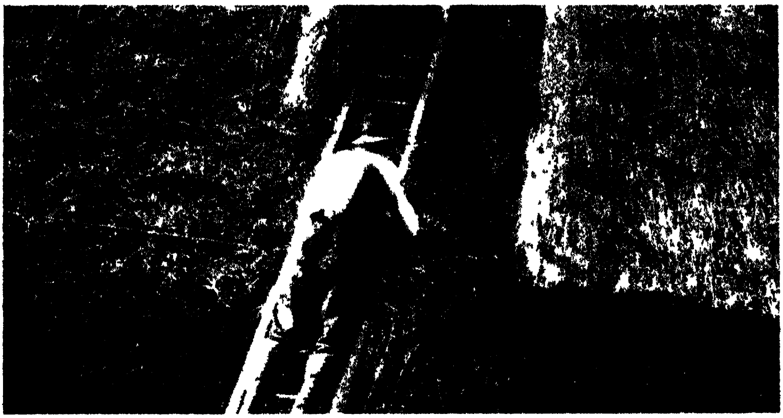

Fig. 10.—Putting False Eave on Lucerne Stack.

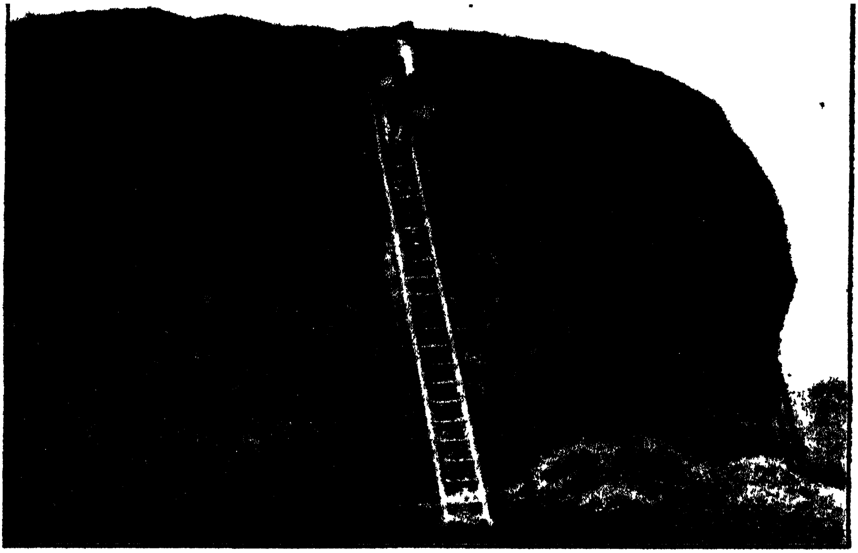

Fig. 11.—Raking Down a Lucerne Stack.

The bolster makes a neat weather-proof edge and the extra work involved is well worth while, as the edge of a stack is one of the most vital points, for if the edge becomes frayed the wind and weather will readily damage the thatch and ruin its protective properties.

The bolster having been secured in position, the tying down twines are secured to it. The number required will, as previously stated, depend on the depth of roof and length of the straw. The twine pegs are temporarily stuck into the bolster while the thatch is being placed in position.

The False Eave.

The first operation after securing the bolster is to put in what is termed a false eave. This is done by taking a handful of straw in one hand, raising the first sheaf above the eave with the other hand, and then driving the straw securely into the stack as shown in Fig. 5. The idea of this false eave is to form a butt for the straw to rest on, as well as preventing wind getting under the bottom of the thatch. The trimmed edge shown in Fig. 5 clearly illustrates the excellent protection afforded.

With the false eave in position, place the layers of thatching-straw as shown in Fig. 6, care being taken to butt them closely up to the previous layers and also to keep them as level as possible. Continue until the ridge of the stack is reached. These layers should be approximately 2 feet wide.

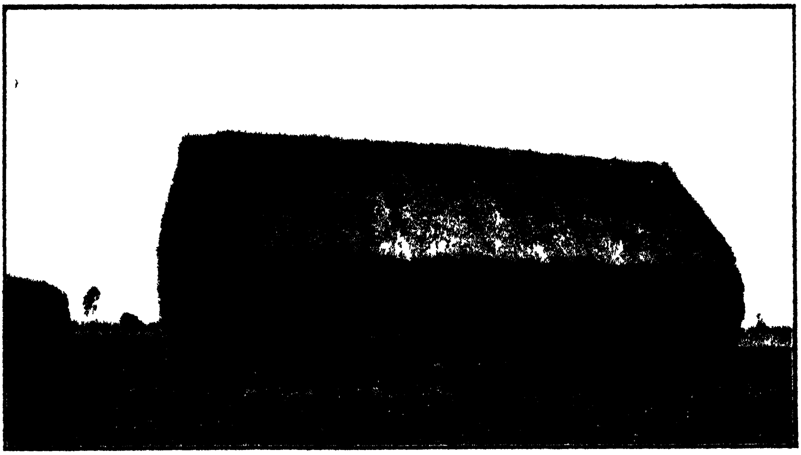

Fig. 12.—A well-thatched Lucerne Stack at Temora Experiment Farm.

Tying the Layers.

Next follows the operation of tying the layers. The thatch-peg with a piece of twine attached as shown in Fig. 1 is driven into the stack on the edge of the layer of straw that has been placed in position. The tying-down twine is then taken and a loop made in it at the correct position. One end of twine on the peg is placed through this loop and the tying-down twine strained tight and made fast by tying the strings on the thatch peg. While straining, beat the thatch down where the twine crosses it, so as to relieve the strain on the twine. (Fig. 7 shows the operation of tying down.)

The advantage of this method of tying-down as compared with the old and more generally used method of tying direct to the peg, is that a more even thatch is obtained, there being no well-defined hollows down the stack between the sections of thatch, through which a certain amount of rain may gain entrance. (See Fig. 8.)

Following tying down, the eave should be neatly trimmed off with a pair of old shears, as has been done in the case of the stack shown in Fig. 8.

When the end of the stack is reached the thatch is finished off by placing another bolster down the edge, just as was done at the other end when commencing.

In the case of stacks with round ends or in the case of round stacks, the method of procedure is very similar, except that a bolster is not necessary, as the thatch continues round the roof of the stack and finishes at the starting point. With round stacks and at the rounded ends of oblong stacks the sections of thatch are brought to a point at the ridge.

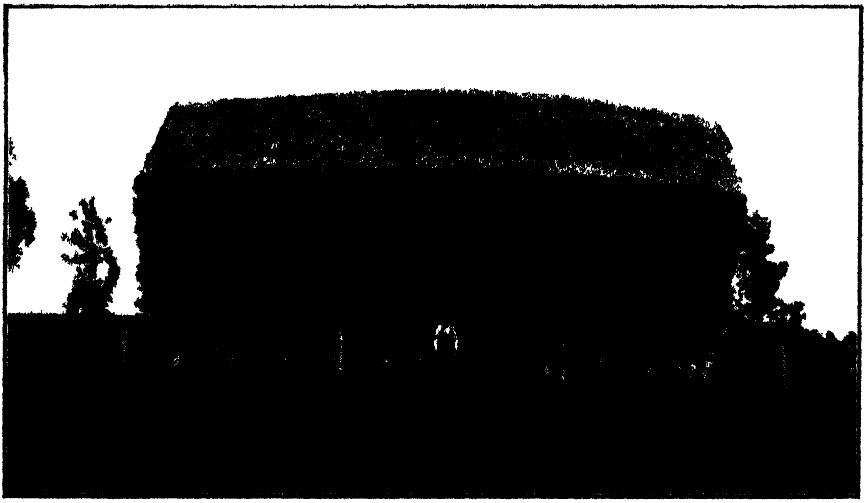

Fig. 13.—A Well-thatched Oaten Hay Stack at Temora Farm.
The stack is built on a straddle for protection against mice.

Thatching Lucerne Stacks.

The ridge of a lucerne stack is never as well defined as in a sheaf stack, hence it is necessary to fit a false ridge. This is done by making a bolster of straw and securing it to the ridge with pegs. (See Fig. 9.) By this means the thatching is brought to a sharp edge, making a far better and more weather-proof stack.

A false eave is fitted as in the case of sheaf stacks, it being necessary to lift the lucerne and force the straw into the stack as shown in Fig. 10. To ensure a level eave and a more workmanlike job, attach a string along the stack as shown in the illustration.

As a rule the roofs of lucerne stacks do not require raking down just prior to thatching, as raking down and smoothing are done at stacking time; in fact, these operations are part and parcel of the work of lucerne stack building.

Stem Rust of Oats.

OBSERVATIONS AT GLEN INNES DURING THE 1930–31 SEASON.

S. L. MACINDOE, B.Sc.Agr., Assistant Plant Breeder.

In the cooler tableland districts and the near western slopes, and particularly in the coldest districts where spring sowing is practised, stem rust of oats frequently occurs, infection being very severe in some seasons. Since 80 or 90 per cent. of the oats grown on the northern tablelands is spring sown, and since stem rust occurs more or less each season at Glen Innes, the work of breeding rust-resistant varieties is an important project at this centre.

Different Rusts of Oats.

As in the case of wheat, there is a stem rust and a leaf rust of oats. The symptoms of stem rust of oats are, in general, similar to those of wheat stem rust. In stem rust of oats brown pustules are formed which throw up the epidermis and run together forming elongated lesions on the stem and sometimes on the leaves. Later in the season the black resting spores are produced, though these particular spores are not known to play any part in carrying the disease over the winter under Australian conditions.

The small, distinctive, orange-yellow leaf or "crown" rust pustules are produced on the leaves and leaf sheaths only, and these may later be replaced by the small, black, flattened resting spore pustules, which do not visibly burst the epidermis.

Leaf or crown rust of oats occurs also at Glen Innes, but is not of as great significance as it is in the coastal districts, where the climate is even more favourable for the development of both rusts. Stem rust is, however, not of such great concern on the coast, where oats are generally grown for green fodder or grazing and are cut before stem rust appears, or at least before it effects much damage to the crop.

The rust fungi which infect the oat plant cannot cause an infection of rust in wheat, nor can wheat rust infect the oat plant. Several common grasses, however, such as cocksfoot, rye grass, barley grass, *Festuca bromoides* and *Phalaris minor*, are known to be susceptible to some forms of oat stem rust.

Reaction of Varieties to Stem Rust at Glen Innes.

Under conditions favourable to the disease, stem rust of oats causes a heavy infection of the leaf sheaths and stem, which considerably decreases the weight and detracts from the appearance of the hay or chaff, and, under conditions of severe infection, causes the production of very pinched grain or none at all. Such a season of severe infection was experienced last year at Glen Innes.

Under these conditions it was possible to observe the marked differences which occurred in the infection of resistant and susceptible varieties, these observations in such a severe epidemic being of much greater significance than in a season of milder infection.

Dr. W. L. Waterhouse, of Sydney University, has determined the presence in Australia of at least five physiologic forms of oat stem rust. This determination is based on the reaction of varieties in the seedling stage to different cultures of the fungus. Recent work has shown the power of certain physiologic forms to cause different degrees of infection at various temperatures in some varieties. The three Australian forms 1, 2 and 7 only were present at Glen Innes during the season under review, but some of the varieties listed as resistant to these forms are expected to show resistance to all or most of the other forms of oat stem rust present in Australia.

The conditions experienced at Glen Innes during the 1930-31 season favoured the rapid spread of stem rust. An abnormally mild winter caused exceptionally luxuriant growth of the plants, which were thus rendered very susceptible to the attack of the fungus. Subsequently, the high rainfall and humidity of October and (especially) November, assisted the rapid germination and spread of the rust spores.

The type of pustules, as well as the number of pustules produced, were used in classifying the varieties according to their stem rust reaction. As in the case of wheat, the manifestation of the inherent degree of resistance or susceptibility of a variety may be influenced by numerous factors. As several plantings were made of most varieties, differences could be traced in the degree of infection of varieties of different maturity planted on various dates. A truer conception of the inherent resistance of varieties was thus obtained.

Very Light Infection (Scale 1).

Birdwood, Burke.
Early Kherson
Iogold.
Laggan.
Richland.
Wisconsin Pedigree No. 7.

No variety was found to be entirely free from stem rust in this season of very severe infection, but the above varieties were apparently extremely resistant by comparison with other varieties. The infection was so light in the case of these varieties, only very small pustules being present, that they can be classed as very highly resistant under the conditions.

Birdwood is a local variety (Sunrise x Reid), Reid being a strain of White Tartarian which has a high order of resistance to stem rust. It is a late variety which is promising for hay at Glen Innes, but is not productive as a grain oat.

Burke is a local selection from the American variety Kherson. It is a promising early variety for hay or grazing in the western districts, but is disappointing at Glen Innes.

Iogold and Richland are varieties introduced from the United States, having been developed at the Iowa Agricultural Experiment Station as selections from the variety Kherson. They do not appear to be of direct value under New South Wales conditions, but Richland has already been used in crosses with local varieties.

Laggan is a very early-maturing, dark-grained selection from the Victorian variety Kelsall's, the exact origin of which is unknown, but which is, peculiarly, quite susceptible to stem rust. Laggan is the earliest maturing oat known in New South Wales, and it is very promising for early dry districts, such as the far western slopes or plains, where, however, its rust resistance is of little significance. It is rather too early maturing to suit the tableland districts.

Wisconsin Pedigree No. 7, a variety introduced from Wisconsin, U.S.A., has not yet been tested for yield.

Selections from some unfixed material supplied by Dr. Hayes, of Minnesota, were also noted to be very highly resistant to stem rust.

LIGHT INFECTION (SCALE 2).

Barker's Tartarian, Buddah,
Burdett.
Lampton.
White Russian, White Tartarian.

Buddah is the well-known variety which is largely grown in coastal districts for its early green fodder and for its comparative resistance to crown rust.

Burdett is a local variety (*A. sterilis* x Victory), which has not yet been tested for yield.

Lampton (Abruzzes x Victory x Reid) is a late-maturing oat which has been yielding well for both grain and hay in comparison with Algerian at Bathurst. Though coarser in the straw than Algerian, it is much superior to Algerian for rust-resistance, but is no better than White Tartarian, the variety most commonly grown in the cooler tableland districts as a spring-sown oat.

White Russian and Barker's Tartarian are strains of White Tartarian.

White Tartarian had a fairly high resistance to stem rust under the conditions at Glen Innes, but Dr. Waterhouse has found that, although White Tartarian is resistant to physiologic Forms 1, 2, and 8 of oat stem rust, it is susceptible in the seedling stage at least to Forms 3 and 7.

Further selections of the unfixed material from Dr. Hayes, Minnesota, also had only a light infection at Glen Innes last season.

A selection D. 102 (Iowa x Green Russian), from Dr. H. C. Murphy, Iowa, was also in this class.

MODERATE INFECTION (SCALE 3).

Adonis, Advocate.
Bimbi, Binda, Bradley.
Green Mountain.
Westdale, Weston.

Adonis, Advocate, Binda, Westdale and Weston are of the breeding Sunrise x Reid, acquiring their moderate infection to stem rust from the Reid parent, a strain of White Tartarian.

Bimbi is Abruzzes x Victory x Reid.

Bradley is a selection from unfixed American material of the breeding Iowa x Green Russian.

Green Mountain is a variety similar to White Tartarian.

None of the above varieties has been sufficiently tested to determine its agronomic value.

Heavy Infection (Scale 4).

Algerian.
Baldwin, Bombo.
Green Russian.
Joanette Strain.
Klook.
Radnorshire Sprig, Ruakura.
Sixty Day, Standwell, Sunrise.

The well-known varieties Algerian and Sunrise appear in this class. Though they may be fairly free from rust in seasons of light infection, there is no doubt that a season of severe infection indicates their fairly high susceptibility to stem rust.

The breeding, origin, or agronomic qualities of the remaining varieties are not of interest on account of their susceptibility.

Very Heavy Infection (Scale 5).

Admiral, Albion, Anthony,
Barwon, Belar, Boree, Boppy,
Brundah, Budgery, Burrage, Byng.
Comewell.
Dun.
Floresti, Forward.
Golden Rain, Grey Winter, Guyra.
Hjarn.
Iowa, Iogren.
Kareela, Kelsall's, Kiah.
Mulga.
Siberian, Spanish White, State Pride.
Turkish Red Rustproof.
Vrome.
White Ligowo.

The well-known and widely grown local varieties Belar, Guyra, Kelsall's, and Mulga are included in this class. Although quite suitable for the drier western districts and although they may be grown without much rust in some seasons on the tablelands, their high susceptibility makes them hazardous for culture in those districts where stem rust is feared.

Extremely Heavy Infection (Scale 6).

Abundance, Alaska, Amarilla, Amery, Argolis, Avena sativa gigantica, Avena strigosa, Asquith.
Banner, Baxter, Beta, Biharia, Bluebell, Black Tartarian, Black Mesdag, Bountiful, Bond, Boomi, Burran, Burt.
Castleton Potato, Chatilovski, Colbert, Cropwell, Creme, Cyprus White, Colorado.
Empire, Enzilbukt, Estramadura Grey.
Fergusson Navarro, Frazier, Fulghum.
Gidgee, Gopher, Groningue White.
Hiver III.
Imbros Island, Ithacan.
Kavota, Kelvin, Kendall, King, Kurri.
Lachlan, Laurel.
Markton, Myall.
Nasgard, Nebraska 21, New Zealand Black, Nortex.
O.A.C. 144.
Palestine.
Romana 6, Roundhead White, Red Rustproof, Rustless.
Saisine, Scotch Grey, Sieger, Smyrna, Stark's Hooiemaker, Strube, Swedish Black.
Tasmanian Giant, Trisperma, Tyrone Tawny.
Victory.
Warrigal, Welsh, Winton, White Cross, Woodford, Wolverine, Waverley.

It will also be observed that the locally well-known varieties Fulghum, Gidgee, Lachlan, Myall, and Palestine are extremely susceptible to stem rust. Though some of these varieties are valuable under dry conditions, they are very risky and unsuitable in the cooler districts where stem rust

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DEPARTMENT OF AGRICULTURE

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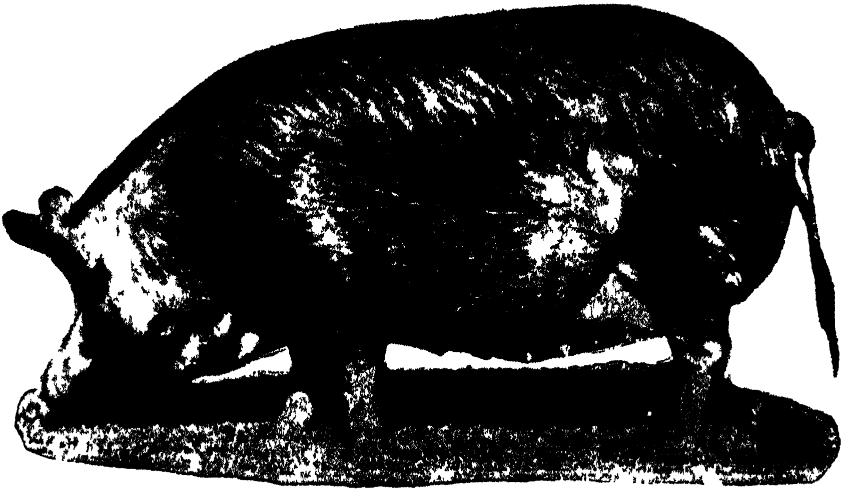

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Cowra Experiment Farm, Cowra.

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G. D. ROSS, Under Secretary, Box 36A, G.P.O., SYDNEY.

is likely to occur in any season. Most of the above varieties are oats introduced from other countries, but some are of local breeding, being bred particularly for the drier districts of the State.

It is worthy of note that such varieties as Red Rustproof and Rustless appear amongst these extremely susceptible varieties. This is another case where farmers are best advised to be guided by the results of careful observations made by the Department of Agriculture rather than trust to the ignorant or conscienceless advertisement of the seedsman.

Breeding Oats Resistant to Stem Rust.

There is a definite need at least in the colder tableland districts of the State for the production of suitable varieties which are more resistant to stem rust. The past season at Glen Innes has certainly been one of greater severity for stem rust infection than has been the experience for some time. This was also the case at Bathurst, on the central tablelands, but stem rust of oats appears with more or less severity in these districts nearly every season.

At the present time White Tartarian constitutes about 90 per cent. of the oats grown on the northern tablelands, which are largely spring sown, and this variety is also most largely grown in the coldest parts of the tablelands throughout the rest of the State. Though not so agronomically suitable, some varieties are more resistant to stem rust than White Tartarian, and there is little doubt that more rust resistant oats which yield as well or better than White Tartarian can be bred. This is regarded as a major project in oat breeding at Glen Innes, and already some very promising material has been selected from an F2 population of the cross Richland x White Tartarian. Dr. Waterhouse, of Sydney University, has indicated that Richland possesses resistance to the physiologic forms of oat stem rust to which White Tartarian is susceptible, so that there is a good chance of obtaining from this cross complete resistance to all physiologic forms present in New South Wales. Bombo, a new oat of excellent productive promise, but which is susceptible to stem rust, has also been crossed with Richland and some good material has also been selected from the F2 generation. Other crosses have also been made with Richland during the past season.

The variety White Tartarian is open to considerable improvement in the commercial quality of its hay, for which purpose it is most largely grown. Though unsatisfactory in this regard, it must perforce be grown in preference to many other local varieties because of its productiveness and comparative rust resistance, but the breeding work in hand is confidently expected to produce superior varieties.

There is also a growing need on the northern tablelands for an autumn-sown rust-resistant oat which will be suitable for early grazing and a final hay or grain crop. Such a practice is well established on the central tablelands around Bathurst, &c., and Algerian and Guyra are the varieties mostly grown for this purpose at present. Both these varieties are highly susceptible to stem rust, and some breeding work is therefore indicated in this direction. Laggan has been freely used in crossing during the past season at Glen Innes, because of its high resistance to stem rust combined with extreme earliness, in the hope of producing some earlier more productive and more rust-resistant oats for autumn or winter sowing in tableland districts.

RESULTS OF THE WHITE MAIZE COMPETITION, 1930-31.

THIS competition, which has been held for each of the last four years, and for which Messrs. Kellogg, Ltd., annually donated the prize money, terminated with last season's contest, the results of which are given hereunder.

The demand for white maize of suitable milling quality has been good, and this competition, organised and judged in conjunction with the field maize competitions, has had the effect of drawing attention to the requirements of manufacturers. The number of entries in the past season's contest was large, and the quality of the maize produced satisfactory.

Particulars in connection with the prize-winning entries are as follows:—

RESULTS of the 1930-31 Competition.

Competitor.	Cultivation.	Germination and Stand.	Condition and Evenness.	Freedom from Insect Pest and Disease.	Purity and Trueness to Type	Estimated Yield.	Total.	Suitability for Manufacture.	Grand Total.	Variety.
Maximum Points	20	10	10	10	15	*		15		
No. 1 District—Upper North Coast.										
Dorrigo and Guy Fawkes Agricultural Association, Dorrigo.										
R. Grace, North Dorrigo	18½	8	9	8	12	24	79½	14	93½	Grace's White.
Coghlan and Spokes, Paddy's Plain ...	18	8	7	8½	12	25½	79	11½	90½	Silvermine.
J. and H. Young, The Meadows, Raleigh..	18	8	8	8	10½	22½	75	12½	87½	„
No. 2 District—Lower North and Central Coast.										
A. C. McLeod, Dunvegan, Tinonee, Manning River	20	10	9½	8½	12	36	96	14	110	Giant White.
W. McLeod, Skye, Tinonee, Manning River	20	10	9½	8	11	34½	93	12	105	„
E. E. Booth, Austral Eden, Macleay River	17	8	9	8½	12	30	84½	13	97½	„
No. 3 District—South Coast.										
J. M. Lamond, The Willows, Terrara, Nowra	19	9	9	8	14	48	107	14	121	Hickory King
J. Graham, Barrengarry	19	9	8	8	13	42	99	13½	112½	„
D. V. Boyd, Rosebank, Terrara, *via* Nowra	19	9	8	8	13	39	96	13	109	„
No. 4 District—Tumut and Gundagai.										
Max Leitch, Bulgary Private Bag, Wagga	19	7½	9	8½	12	45	101	12	113	Murrumbidgee White.
†A. Back, Gilmore, Tumut	18½	7½	8½	7½	11½	39	92½	13	105½	„
†J. T. Hainsworth, Terrabandra, Gundagai	18½	7½	7½	7½	11½	42	94½	11	105½	„
No. 5 District—New England.										
G. B. Koch, Steinbrook, Tenterfield ...	17	7½	8½	8	10½	33	84½	14½	99	Hickory King.
M. P. Shanahan, Hillview, Uralla	19	7½	7½	8½	9½	33	85	13	98	Silvermine.
Rolph Bros., Bungulla, Tenterfield ...	18½	8	8	8	10½	30	83	14	97	Hickory King.

* 3 points for each 10 bushels per acre in districts 1, 2 and 3, and 3 points for each 5 bushels in districts 4 and 5.

† Equal for second place.

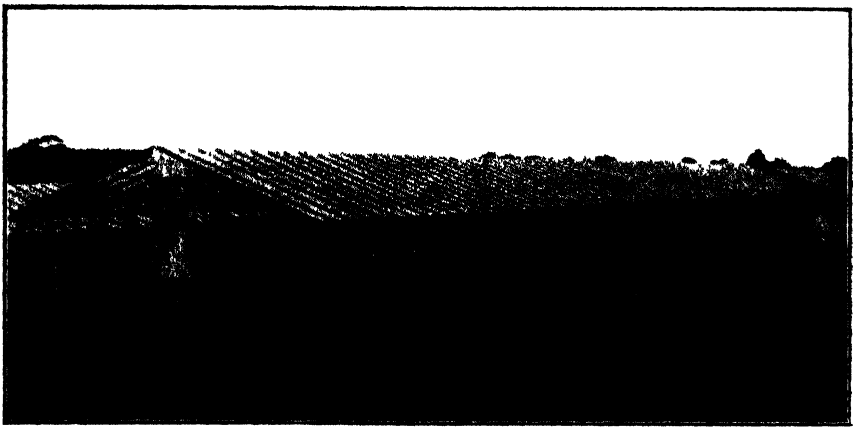
L. S. HARRISON, Special Agricultural Instructor.

Glass-house Tomato Varieties.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

In tomato growing, whether in glass-houses or in the field, situation of the farm and the ability of the grower are factors of more importance than varieties. Where other considerations are equal, however, the difference between the returns from growing suitable and unsuitable varieties is often very great.

While the problem of selecting the most suitable variety for a particular district is not always easy, my experience has been that any suitable variety that has been intelligently selected and improved by a grower is far superior to the ordinary commercial seed of that same variety. Departmental trials have demonstrated this point, as well as bringing to light other valuable varietal characteristics, such as disease resistance, early pollination, &c.



Standard Type of Glass-house.

The testing of varieties for suitability to glass-house culture is, however, quite a different proposition. This side of the tomato-growing industry is only in its infancy, and few growers are in a sound enough position to be able to devote a sufficiently large section of their glass-houses to variety trials. Moreover, in the majority of glass-houses the conditions are not uniform enough to render experiment results comparable. Under the circumstances, glass-house variety trials have necessarily been limited to the growing of a few plants of a number of varieties, and for the rest relying upon observations made as to their behaviour. During the past two seasons this method has proved reasonably satisfactory, and it has been possible to discard a number of varieties, which, if tested out on a large scale, would have meant considerable financial loss to the experimenters.

The Present Position as Regards Varieties.

At present most of the glass-houses in this State are of a temporary nature, but it is anticipated that within the next few years the more progressive growers at any rate will be compelled by keener competition to reconstruct their glass-houses and instal internal heating systems. The only tomatoes with which our early glass-house fruit has now to compete are the Queensland tomatoes, which are of the poorest quality, and consequently the glass-house tomato commands double the price of this field-grown product. With such an advantage in their favour, and in view of the likelihood of revolutionary changes in the construction of glass-houses within the next year or two, it would not be wise at this juncture, in making recommendations as regards varieties, to depart from the Chinese group, varieties of which are now being grown more extensively under glass than any other variety. However, where a heating system has been installed, and in large glass-houses of the better type, situated on light soil in a good locality, varieties such as Tuckwood and Bonny Best should prove successful. A tall house naturally gives sufficient room for the taller-growing, better-quality varieties. On the other hand, it has to be remembered that the tall-growing, round varieties always demand additional attention at flowering time in order to ensure a good setting of fruit.

Tall-growing Type of Plant.

Dwarf Type of Plant.

Chinese Types Most Widely Grown.

The bulk of the tomatoes grown under glass in Australia are of the Chinese group. The leading growers have used these types for years, with the result that many different strains and variations have been evolved. The commercial varieties included in this group are Market Favourite, Atlantic Pride, Bendigo Dwarf Red, Adelaide Dwarf, &c.

The outstanding characteristics of these varieties are:—

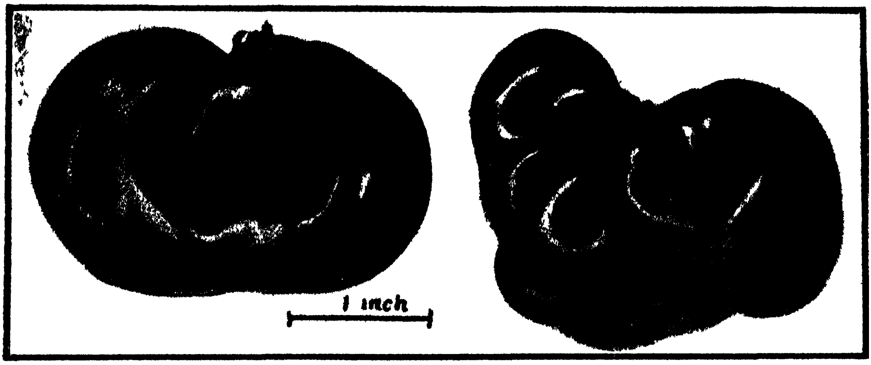
(1) They all belong to the first-early maturers.

(2) They all pollinate at low temperatures and under adverse conditions.

(3) The colour of the fruit is a very deep, rich red.

(4) The solid content of these varieties is very high.

(5) The plants of the majority of the selections of these varieties are dwarfed.



Chinese Varieties, Showing Variation in Different Strains.
The fruit on the left is of good, and that on the right of undesirable, shape and quality.

The foregoing points make the Chinese varieties very suitable for growing in the low set, unheated, standard glass-house. Many of these varieties, however, are of poor quality. Fortunately, up to the present time quality has not been a serious consideration, owing to the fact that the glass-house tomato is the only fresh local product on the market in the early spring months. As the area under glass-house tomatoes increases, however, competition will become keener and quality will be of prime importance.

Description of the Chinese Varieties.

The shape of the fruit is flat and wrinkled, although this latter character is only slightly evident in the improved strains. The flesh is usually thin, which encourages the fruit to become puffy towards the end of the season.

Some strains are most prolific in the production of flowers; in some cases as many as fifty blooms are produced on one bunch. These blooms do not always pollinate, but quite often produce a retarded setting, which consists of a large number of fruits (with a marked absence of seed) that do not grow to more than 1 inch in diameter. Such fruit is most difficult and slow to pack, and, furthermore, it commands only very poor prices. Moreover, this retarded setting is always brought to maturity at the expense of the other fruit on the plant.

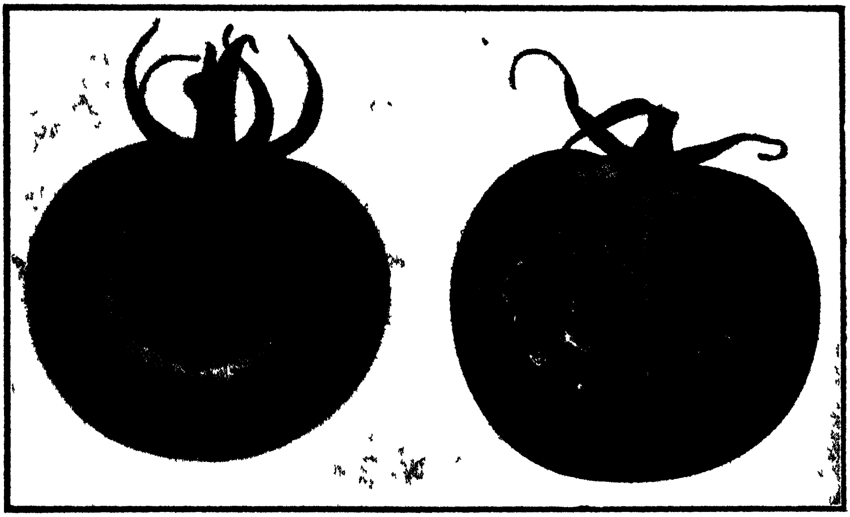
With all its shortcomings, under present conditions, at any rate, the Chinese group is capable of supplying varieties most suitable for glass-houses in any part of the State. Success with any given variety, however, is mainly governed by the amount of care and intelligence with which it is selected, for it will be found that any variety will deteriorate if it is not selected on the right lines. Seed should be saved from individual plants selected in the field, and not from fruit in the packing shed. In selecting in the field the grower should have an ideal fixed in his mind, and select plants that approach nearest to that ideal. Disease resistance should be regarded as a factor of the greatest importance when selecting for seed.

Chinese Type. Showing Heavy First and Second Bunches.

Fusarium Wilt.

Fusarium wilt disease is one of the biggest problems with which the glass-house tomato-grower has to contend, and, as most of the Chinese varieties are very susceptible to this disease, it must be only a matter of time before it will be impossible to continue growing the present varieties under the conditions that exist to-day.

There is no known fusarium-resistant variety that can be recommended for commercial culture under glass, although such varieties as Marglobe, Marvana, Marvelosa, Norton, and Norduke have proved very resistant when grown under field conditions. Norton and Norduke are too late maturing to be suitable for growing under glass, and the difficulty with the other varieties is to get them to set fruit, while the vigorous growth of Marglobe and Marvelosa also renders them unsuitable. Of the lot Marvana should prove the best for glass-house work, as it sets fruit better and the fruit is smaller than either Marglobe or Marvelosa. Ideal was reported to be a fusarium wilt-resistant variety suitable for glass-houses, but it has turned out a failure.



Bonny Best.

Note the high quality, solid flesh of the cut fruit

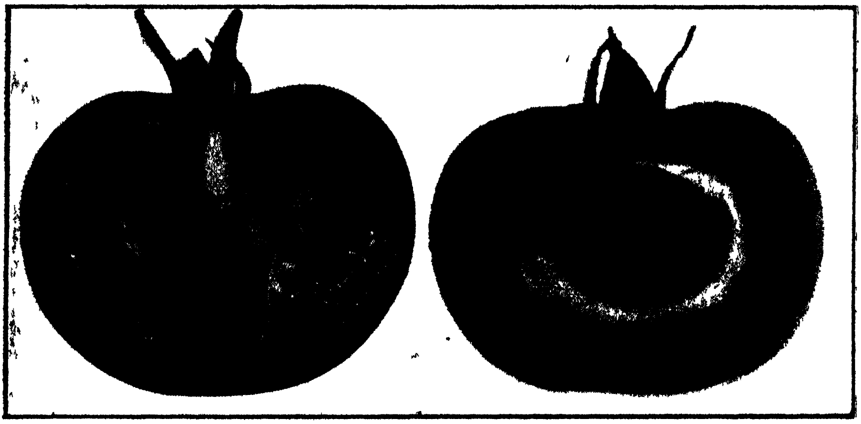
The solution of the problem seems to be the production of a new variety by the crossing of the present known resistant varieties with the more suitable glass-house types. The plant-breeders of the Department are working along these lines at the present time. In the meantime growers should continue to grow the varieties that have proved most suitable for their locality, and subject the soil in their glass-houses to steam sterilisation when it becomes infected with the fungus.

Observations on Other Varieties.

The following observations as to the behaviour of certain varieties under glass were made during last season:—

Bonny Best.—A poor setter under most conditions, particularly in the standard glass-house. In large houses and in those that are artificially heated this variety does well. The fruit is of excellent quality, but under certain conditions is inclined to be small at the top of the plant. This variety has a fairly robust constitution and stands up to the hot late weather better than the dwarf types.

Chalk's Early Jewel.—Very similar to Bonny Best, although in all cases last season the fruit was much smaller.



A Cluster Type.

Spark's Earliana.—A tall, uneven grower, not suitable for growing under glass. The flower sprays are long, uneven and liable to be injured during the working of the houses. The setting of the fruit is, under the best of conditions, very uneven, and the size of the individual fruit varies considerably. The quality of the fruit, however, is far superior to the dwarf types. Although this variety yielded well at Dudley last year, it cannot at this stage be recommended as a suitable glass-house variety.

Earliwinner.—An Earliana type, somewhat similar to Sunnybrook Earliana. This variety produces an abundance of flowers, which is a good feature for glass-house work. The fruit is of an excellent colour, but a hollow is left when the stalk is removed. Earliwinner is one of the best of its type for glass-house work, but cannot be recommended in preference to a number of others.

Foster's First-of-All.—This is another Earliana type, but even under the excellent conditions of last season it failed to set even a medium crop of fruit.

Pink Queen.—A pink-skinned Earliana type. This variety is well known in the field for its good pollination under unsuitable conditions. It was tested only at Dudley last season, where it proved satisfactory. The fruit in this instance was of good, uniform size, but owing to its pink skin may be confused with the poor quality Queensland varieties that are on the market at the same time. Pink-skinned varieties are very popular in northern markets, but fail to bring good prices in Sydney. Although further trials and planting at the right time may prove this to be a satisfactory variety, observations to date point to its being unsuitable for growing in the standard size glass-house.

Comet.—A very robust, tall-growing variety. It is a poor setter under conditions met with early in the season, but in the early spring it sets heavy bunches. The fruit is red, longish in shape, of excellent quality, with a few rough individual fruits in the early bunches. It cannot be recommended.

Wheslen Giant.—A round-fruited English type. The bottom bunches do not set well, although the second and third lots of fruit last season were very heavy. The flowers have a short stubby stamen cluster, which is very pronounced. The fruit is round, dark crimson in colour with a green top. The flavour is excellent, being rather mealy and mild. The skin on the fruit is very tough. It is another variety that cannot be recommended.

Kondine Red.—I saw this variety growing under all conditions last year and was not very impressed with the results, although it is said to be the standard glass-house type in New Zealand. Under excellent conditions at Harbord, this variety did not prove any more suitable than the average English type. The setting in the early stages of growth was poor, while the setting of the top bunches was very heavy, resulting in abundance of fruit of very poor size. The fruit was very juicy towards the end of the season with a poor, sweet flavour. May be useful in artifically-heated houses.

Jersey Beauty.—This variety was very extensively grown last year with various results. In the glass-house at Hawkesbury Agricultural College, where heat is applied, thus encouraging a good pollination, excellent results were obtained. In districts away from the coast in standard houses the variety was a failure. In the large glass-houses on the coast under good conditions the variety gave good results. Under all conditions the setting was not as good as the dwarf types, but in all cases the quality of the fruit was much superior. One of the chief disadvantages of Jersey Beauty is the fact that it takes much longer to colour up after maturing than other varieties. This is one of the improved, high-quality varieties that has been marked for further testing this season.

Tuckwood.—From observations made on the limited number of plants of this variety grown last year I would say this is by far the best of the round varieties. It has shown up in one of the worst possible years as a variety far superior to both Bonny Best and Jersey Beauty. A few plants grown in standard houses in a frosty district made a setting of very high-quality fruit when all others, excepting the dwarf types, dropped their flowers. In a large house on light soils near the coast the setting was excellent at all stages of growth. The fruit is deep crimson in colour, flat-round in shape, of excellent quality with a marked absence of core. Tuckwood, although not as early as the dwarf types, colours up much quicker than Jersey Beauty. Very little seed of this variety was available for distribution this year.

Whole Salad.—This variety has been under observation for the past three seasons. It is a most prolific setter, but unless the soil conditions are kept up to first-class standard by continual cultivation, feeding, &c., the percentage of small fruit will be high. The fruit is flat-round and of good quality.

Ideal.—Although reputed to be a wilt-resister, it did not prove so even in the least degree under our conditions last season. It is a very poor setter, and the fruit, under all conditions, is small. Ideal is totally unsuitable for glass-house culture.

Other varieties that failed under present glass-house conditions, and which are not worth describing, are:—Conqueror, March Beauty, and Orange Prolific.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1931.

Parramatta (J. G. Harford) ...	Oct.	5
Narrandera (J. D. Newth) ...	„	6, 7
Ariah Park (Mort Collings) ...	„	7
Quandialla (Stuart Tompkins)...	„	7
Walbundrie (H. G. Collins) ...	„	7
Griffith (M. E. Sellin)	„	13, 14
Bribbaree (J. Aston)	„	14
Carcoar (T. G. Stammers) ...	„	14
Cootamundra (G. B. Black) ...	„	20, 21
Millthorpe (H. P. Smith) ..	„	20, 21

1932.

St. Mary's (T. Green)	Jan	30
Tumut (Milton Archer)	Mar.	1, 2
Mudgee (T. P Gallagher) ...	„	1, 2, 3
Cooma (G. E. Metcalfe)... ...	„	2, 3
Kempsey (E. E. Mitchell) ..	April	6, 7, 8
Taree (C. A. Jackson)	„	7, 8, 9
Wingham (C. H. Blenkin) ..	„	13, 14
Casino (E. J. Pollock)	„	27, 28, 29

INFECTIOUS DISEASES REPORTED IN AUGUST.

THE following outbreaks of the more important infectious diseases were reported during the month of August, 1931:—

Anthrax	Nil.
Blackleg	6
Piroplasmosis (tick fever)	Nil.
Pleuro-pneumonia contagiosa	17
Swine fever	Nil.
Contagious pneumonia	2
Necrotic enteritis	1

—MAX HENRY, Chief Veterinary Surgeon.

Lettuce Varieties in New South Wales.

[Continued from page 689.]

N S SHIRLOW, B Sc Agr, Assistant Plant Breeder, Hawkesbury Agricultural College

Descriptions of Varieties—*continued.*

Deacon or The Deacon.

Butter type, cabbage heading, young plants rather flat and spreading, appearing more upright when mature, medium to large size, heads soft and buttery, globular to slightly flattened with leaves overlapping rather loosely, forming a distinct, but not very solid head, leaves broad, smooth to slightly blistered, and coarsely folded or crumpled, not twisted, thick, but not particularly stiff, borders flat and not serrated at margins; colour medium to light green showing no reddish or brownish colouration; seeds whitish.

Fig. 6.—Deacon.

Season.—Mid-season to late, sure heading in summer and winter; does not run to seed very quickly in summer and stands cold fairly well.

Quality.—Good; soft and buttery.

Chief Distinguishing Characters.—Somewhat like All-the-Year-Round, but not so compact and has smoother leaves. Distinguished from this and other varieties in its colour group by whitish seeds.

Drumhead.

Crisp curled type, cabbage heading; plants very large; loose but not spreading in habit and upright, especially in young growth; head oval in shape with leaves regularly overlapping, but with some loose spaces between them forming a softer heart than others of its type, although the leaves comprising it are stiff and brittle; the outer leaves of the plant grow well up around the head; leaves fairly short, but not particularly broad in shape, lightly blistered and crumpled, twisted, very coarse in appearance with prominent heavy veins and large protruding midrib, margins lightly serrated, borders broadly or coarsely frilled to undulate; colour medium glossy green, not spotted or brownish in any part; seeds whitish.

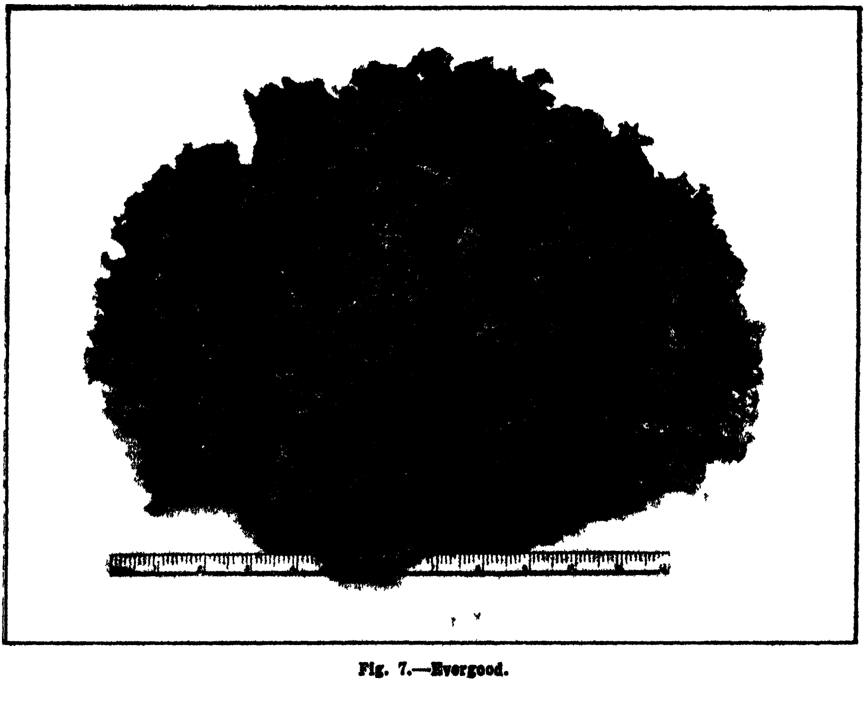


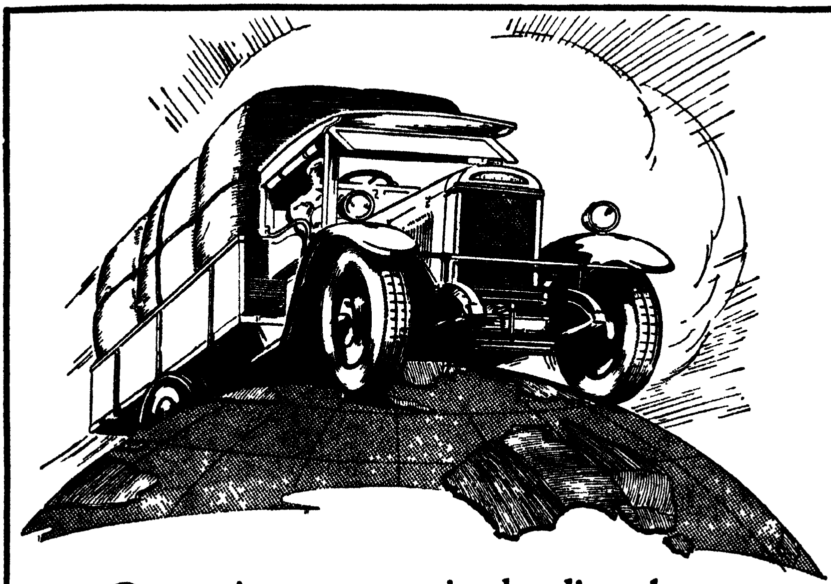
Fig. 7.—Evergood.

Season.—Late-maturing; grows well in cold weather, but runs to seed quickly in summer.

Quality.—Coarse and hard in texture, but quite crisp.

Synonym.—Malta.

Chief Distinguishing Characters.—Most like Brittle Ice, but can be distinguished by its glossy colour and more blistered leaves.



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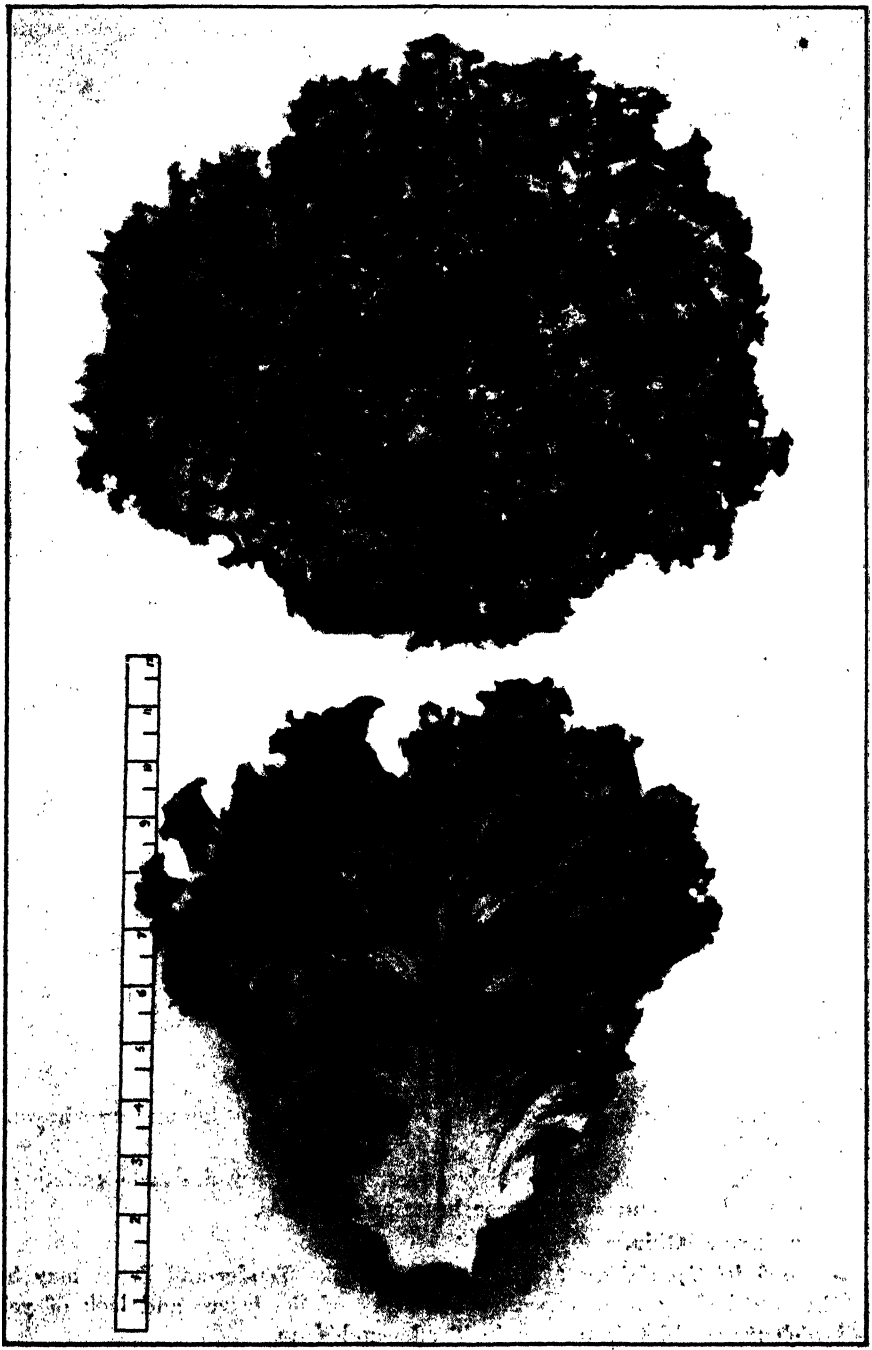


Fig. 8.—Grand Rapids.

Evergood.

This variety has been included in the crisp curled, prickly or bunching class, although sometimes a fair head is formed. It is not very uniform in type and forms blanched, but rather loose heads under very favourable conditions; rarely heads in hot weather.

The plants are large, spreading in habit, and not very compact; leaves very broad, very finely and excessively blistered and much crumpled, margins serrated and frilled, but not so finely frilled as to give the same degree of prickly appearance as in Grand Rapids or Boston Curled; colour light green, no part reddish; seeds whitish.

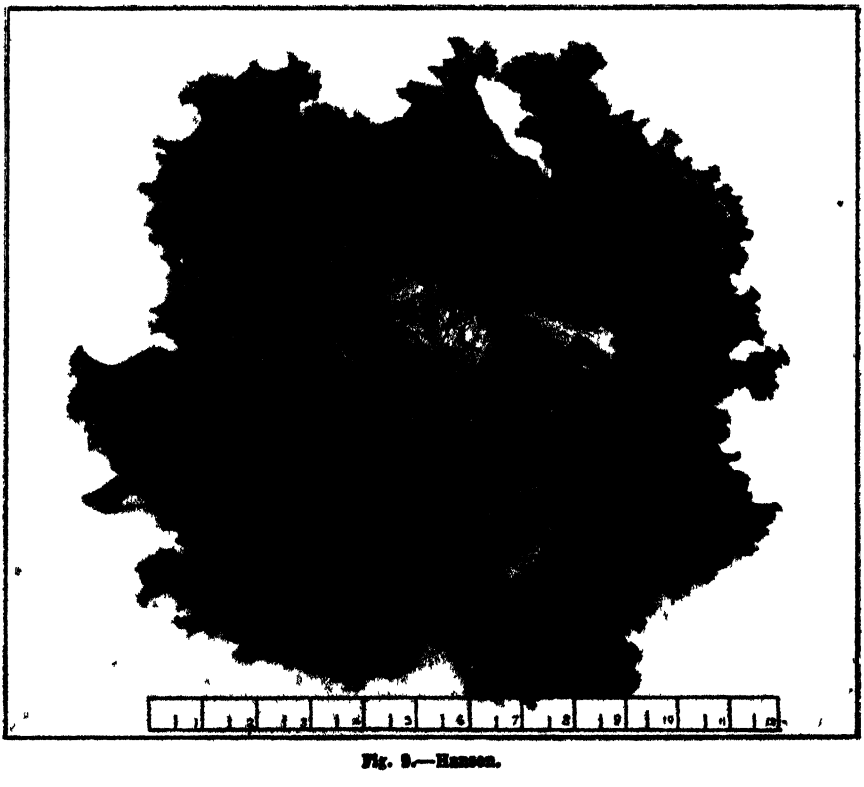


Fig. 9.—Hanson.

Season.—Medium-maturing; does not stand well in summer and browns off with frost.

Quality.—Very crisp and fairly sweet. Not a very desirable variety on account of unevenness and poor hearting qualities.

Synonym.—Ohio.

Chief Distinguishing Characters.—Most like Tender-and-True; may be distinguished by more excessive blistering of the leaves and lack of yellowish tinge which is present in Tender-and-True.

Grand Rapids.

Crisp curled type; prickly leaved or bunching, plants spreading when young, later assuming a more upright and bunching habit and forming a loose cluster of leaves, but not overlapping enough to form a head; leaves are short, excessively blistered and crumpled, slightly twisted with coarse veins and large midrib, margins toothed and borders finely and excessively frilled; colour light green, never brownish or reddish in any part, seeds blackish.

Season.—Early-maturing, good in winter, but inclined to run to seed fairly quickly in summer.

Fig. 10.—Iceberg

Quality.—Crisp, but not very sweet; a poor market type as no heads are formed. If planted closely together the inner leaves become blanched to a certain extent.

Chief Distinguishing Characters.—Has blackish seeds like Boston Curled, but is much larger in size.

Hanson.

Crisp curled type, cabbage heading; plants medium in size and spreading, but not loose in habit; head globular, very hard and well blanched with leaves very tightly overlapping; leaves broad in shape, finely blistered and crumpled and fairly twisted. Stiff and fairly coarse in appearance with heavy veins and large mid-rib, margins finely serrated and borders finely frilled; colour light brown green, never reddish or brownish in any part; seeds white.

Season—Late-maturing, grows well in winter; inclined to form poor heads in very hot weather.

Quality.—Excellent, very crisp, firm and sweet.

Synonym.—American Summer.

Chief Distinguishing Characters—Lighter green than Wonderful and not tinged with red as in Iceberg Practically indistinguishable from Tender-and-True until mature, when it lacks the yellowish tinge of Tender-and-True and forms a better head.

Iceberg.

Crisp curled type, cabbage heading; plants large and spreading, but not loose in habit; head globular, well defined and generally exposed, *i.e.*, the outer leaves fall away somewhat; very hard and well blanched; leaves very broad, blistered, crumpled and twisted, rather thick, stiff with heavy veins and large midrib, margins serrated and borders finely frilled; colour light green tinged with reddish brown mainly at the borders; inner head leaves never coloured reddish; seeds white.

Season.—Late-maturing; stands heat well, but makes rather poor growth in winter.

Quality.—Very good, crisp, firm and sweet.

Synonyms.—Champion Cabbage, Tender Heart.

Chief Distinguishing Characters.—The light green colour and reddish colouration in the leaves serve to distinguish it from Wonderful and Hanson.

(*To be continued.*)

BENZINE CANS AS MILK CONTAINERS.

BENZINE cans are frequently converted into buckets and used for holding milk and cream and for other purposes. As ordinarily used, however, they are objectionable owing to the grooved seams round the bottom and in the corners, as well as where the top has been cut out. Rust soon forms in these crevices, and as they cannot be easily cleaned they act as lodging places for decaying milk and cream.

To make such tins suitable for receptacles for milk and cream, the grooved and folded seams and the cut seam at the top should be smoothly flushed with solder prior to use. The bottom corners of these improvised cream buckets are the most difficult to keep clean, and a good plan is to melt a little extra solder into these corners to form a smooth triangular-shaped filling. If all the seams are treated in this way a very useful and sanitary dairy utensil will be provided, and the life of the can will be longer.

Grazing Lucerne and Top-dressed Pastures for Fattening Lambs.

E. A. ELLIOTT, Sheep and Wool Expert, and A. W. S. MOODIE, H.D.A., H.D.D., Assistant Agrostologist.

AN experiment to determine the comparative values of grazing lucerne, top-dressed natural pastures and untreated natural pastures for fattening lambs was commenced during 1930 at Temora Experiment Farm and will be continued for a number of years.

In this experiment no attempt has been made to record the carrying capacity of the various pastures in the trial, as it was desired, in fairness to the natural pasture group and in order to test the quality rather than the quantity of feed, to allow each group ample grazing area. In both the 1930 and 1931 seasons, however, the lucerne and top-dressed natural pasture would have carried considerably more stock than the unmanured pastures.

The 1930 Season's Trial.

On 21st August, 1930, twenty-nine Dorset Horn-Comeback lambs that had been dropped in July were divided, as evenly as possible according to weight, into two groups of ten and one of nine, and placed, along with their mothers, in three separate paddocks, one containing lucerne, another natural pasture top-dressed with superphosphate at the rate of 1 cwt. per acre, and the third unmanured natural pasture. The lucerne pasture contained a small percentage of barley grass, wallaby grass, and trefoils, whilst the natural pastures consisted mainly of barley grass and trefoils with a small percentage of wallaby grass. The quantity and development of trefoil were greater in the top-dressed pasture than in the unmanured pasture. Seasonal conditions being for the most part favourable, there was at all times ample succulent feed for each group.

Periodical inspections showed that the lambs on unmanured natural pastures did not make the same rapid progress as the other two groups.

On 21st October, two months after the groups were placed in the various pastures and when the lambs were approximately three months old, those on lucerne and top-dressed pastures had reached suitable export weight. The lambs were dispatched from Temora on 4th November, and slaughtered on arrival at Homebush abattoirs, the following particulars of the frozen weights being supplied by the Metropolitan Meat Industry Board:—

	Total Weight. lb.	Average Weight. lb.
Lucerne pasture (10 carcases)	375	37·5
Top-dressed natural pastures (10 carcases)	384	38·4
Untreated natural pastures (*8 carcases)	229	28·62

* One lamb in this group died on 23rd September, 1930.

The 1931 Season's Trial.

Comeback ewes not being available, Merino ewes were substituted and mated to Dorset Horn rams. It was realised that the lambs would probably not be classed as first grade on this account, but for educational purposes it was decided to continue the trial. Next season it is hoped to use first-cross Border Leicester-Merino ewes mated to Dorset Horn rams.

Mating took place in November, 1930, the lambs were born between 5th and 19th April, 1931, marked on 11th May, and on 19th May were drafted with their mothers into separate paddocks as in the previous season's trial; as a matter of fact the same paddocks of top-dressed and unmanured natural pasture were used as in 1930. The top-dressing (1 cwt. per acre of superphosphate) was carried out on 15th and 16th April.

Ewes and Lambs on Lucerne Section of the Trial, Temora Experiment Farm.

The average weights of the lambs at the first weighing on 19th May were:—(*a*) Lucerne pasture 28.7 lb., (*b*) top-dressed natural pasture 29.3 lb., (*c*) untreated natural pasture, 28.7 lb.

Seasonal conditions were entirely favourable throughout and each group of lambs had ample feed. There was a marked contrast between the top-dressed and unmanured pastures, however, the former carrying an excellent growth of clover with a fair percentage of wallaby grass and no bare patches, whilst in the latter the clover growth was thin and there were many bare patches. It was estimated that in June the manured area carried 100 per cent. more feed than the unmanured. On account of the exceptionally high rainfall the pastures were rather wet, and the least affected would be the lambs on the unmanured pastures, where the bulk of feed was considerably less than in the other two paddocks, though more than sufficient for the animals it was carrying.

Weighings were made at fortnightly intervals, and two months after being placed on the different pastures the lambs were approaching marketing weight and appearance. They were forwarded to the Metropolitan Meat Industry Board abattoirs and slaughtered on 5th August.

The average weights of the lambs in the three groups and the slaughtered weights were as follows:—

Lambs on—	Average Live Weights.						Average Slaughtered Weights (5-8-31)	
	19-5-31	4-6-31	17-6-31	1-7-31	15-7 31	30-7-31	Hot.	Cold.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Lucerne	28·7	38·9	46·2	54·1	62·6	72·4	33·9	33·8
Top-dressed pasture ...	29·3	39·7	48·2	57·1	65·1	72·4	33·2	32·9
Unmanured natural pasture	28·7	37·7	46·2	53·6	59·6	67·0	29·6	29·5

Results to date indicate that when conditions are particularly favourable to pasture growth, as during the 1931 season, lambs can be fattened readily on the natural pastures. The 1930 season, or rather that portion of it during which the trial was carried out, was also favourable, and clearly showed that lucerne and top-dressed pastures were both superior to natural pastures for fattening lambs under average to good conditions. It may, therefore, reasonably be concluded that only in an exceptionally good season such as 1931, which rarely occurs in New South Wales, can lambs be quickly fattened on the natural pastures.

A Book Worth Many Times Its Price.

The thousands of farmers who have purchased copies of *"The Farmers' Handbook"* would all unhesitatingly subscribe to the claim that it is worth many times its price. Some indication as to its scope is to be had from the following list of sectional headings:—Farm Lands of New South Wales; The Chemistry of the Soil; The Farm Holding; Wheat Culture; Cereals other than Wheat; Root Crops; Leguminous Crops; Miscellaneous Crops; Vegetable Crops; Grasses and Pastures; Silos and Silage; The Feeding of Farm Stock; Weeds on the Farm; The Handy Man on the Farm; Farm Measurements and Handy Tables; Bookkeeping for Farmers; Farmers' Calendar; Index.

Obtain your copy from the Department of Agriculture, Box 36A, G.P.O., Sydney. Price 11s. 6d., including postage.

The stomach of the pig is only small, but the intestines are of great length, indicating great digestive powers, and for these reasons the pig must be fed frequently and at regular intervals.

Tapeworm in Sheep.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research.

THE manner in which the common tapeworm of sheep, *Moniezia expansa,* is transmitted from sheep to sheep remains one of the unsolved problems of parasitology, though many attempts have been made to find out how such occurs.

Life-history of Other Tapeworms.

It may first of all be mentioned that in the case of practically all other tapeworms the parasite infests in succession two different species of animals, spending the larval stage in one and the adult stage in another. Thus the common hydatid tapeworm, *Taenia echinococcus*, has its adult stage in the dog and its larval stage in some species of ruminant (sheep, cow, goat), man, monkey, &c. In the case of certain tapeworms the larval or cystic stage exists in an insect; thus the dog tapeworm, *Dipyllidium,* has its cystic stage in the dog flea. In some cases this insect host is itself a parasite, as is the case with the dog flea; but in other cases it is a free-living stage, existing quite apart from the host. Thus the larval stage of certain fowl tapeworms exists in slugs and snails.

In the usual type of life-history the young embryos (eggs) leave the adult host with the droppings. These embryos enter the intermediate host generally by way of infected food or water. In this intermediate host the larvae develop, many species forming a cyst-like body or hydatid. This, when eaten by the final host, develops into a mature tapeworm. Dogs, of course, commonly become affected with the hydatid tapeworm by eating affected lungs or livers of sheep or cattle.

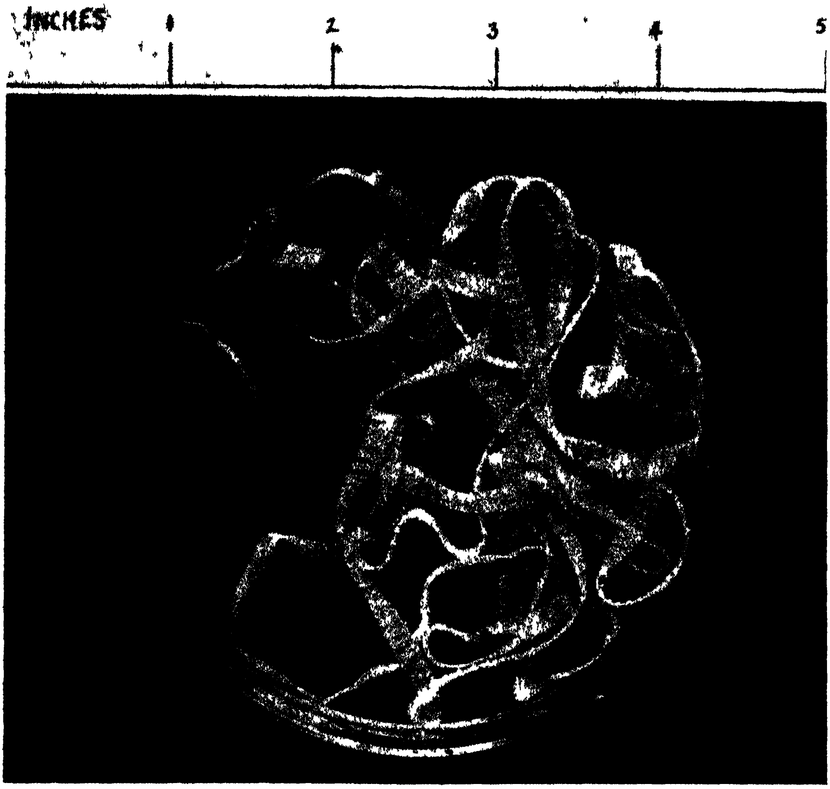
Life-history of Sheep Tapeworm (*Moniezia expansa*).

In the case of the sheep tapeworm, it has been thought by some that the larval stage is spent in an insect. On numerous occasions insects have been collected and fed to sheep in attempts to ascertain which one acted as the intermediate host. In no case, however, have tapeworms developed in the animals so fed. Others have thought that infection may be transmitted in the milk, and other workers again have considered the possibility of infection being conveyed to the foetus whilst in the womb, it having been observed that comparatively young lambs may harbour tapeworms.

In order to gather some information as to the conditions under which tapeworms may be transmitted, certain experiments have been undertaken at Glenfield Veterinary Research Station during the past two years. For this purpose a number of lambs were carefully raised from birth under such circumstances that they could not contract a natural infestation with this parasite. Sheep affected with tapeworms were allowed to graze in certain pens, and after their removal the experiment lambs were placed in the same pens. It was then found that sheep might pick up the infection from fenced grassed areas, or even from a gravelled pen which had previously contained sheep affected with tapeworm, and, further, that when some of the grass was cut from such a grass pen and fed to a lamb, that lamb developed the sheep tapeworm.

Tapeworm in Sheep is Contracted by Ingestion.

These experiments, therefore, show that this tapeworm is not transmitted directly from sheep to sheep by contact, but is, in some fashion, gathered from the ground. The fact that it was contracted from herbage grown on infected ground would indicate that the infective stage of the parasite was present on grass. Careful search of the grass fed did not reveal any insect such as could be detected with the naked eye, and if an insect is required for the intermediate host such insect must be minute indeed, or else the parasite after infecting such insect must escape from it in some way. The fact that infection was picked up by sheep running in a gravelled pen rather suggests that no insect host is necessary, but that the eggs of the tapeworm after leaving the sheep undergo certain development before



Common Tapeworm of Sheep.
Note the tape like appearance, that the parasite is segmented and that the head is at the thin end of the worm (shown on left of the photograph)

reaching an infective stage. It is well known that the eggs as they leave the sheep with the droppings are not infective, for several investigators have attempted to infest sheep by drenching eggs and even large quantities of ground-up segments of tapeworms.

Our experiments definitely show, therefore, that the common tapeworm of sheep is contracted by ingestion, and they indicate further that quite likely an intermediate host is not necessary, but that the eggs after leaving the sheep must undergo certain development before infecting another sheep.

Life of Tapeworm Within the Sheep.

It has been found that tapeworms reach maturity in forty to fifty days after entering the intestine of the sheep. They then lay eggs for about three weeks, and shortly after that time die and disappear. Thus sheep are infested for only a comparatively short time, say, two to three months.

It has also been found that an infected area may retain its infection for at least eleven months, and that such ground is infective both in summer and winter. This explains how it is that successive drops of lambs are infected.

Immunity to Tapeworm.

An important discovery made in our recent experiments is that when sheep have recovered from an infestation with tapeworm they are subsequently immune and cannot be reinfected. On several occasions lambs, which had previously been affected with tapeworm but which had recovered from that parasite, were depastured on infective areas along with lambs of the same age but hitherto not affected with tapeworm. In all cases those previously not infected have contracted infection, but those previously infected have been immune.

It has further been found that by drenching fresh ground-up tapeworm segments immunity is produced.

General Observations.

The above facts explain certain peculiar features which have been noted in connection with the tapeworm in sheep.

Firstly, tapeworms are found very much more commonly in lambs than in grown sheep. Their absence in older sheep is to be ascribed, therefore, to immunity following an earlier infestation with tapeworm. Where sheep older than lambs are affected with tapeworm these animals have evidently not been affected with tapeworm as lambs, having, during their earlier life, evidently been grazed on areas where tapeworm infection does not exist.

Secondly, it has commonly been noted that when lambs are affected with tapeworm and drenched an examination of them some time later has shown them to be free of tapeworm. It has been assumed that such has been due to the drenching, but probably in such cases the disappearance of the tapeworms has simply been due to the latter having attained their full development and disappeared naturally from the animal. When lambs are infested with tapeworm they commonly harbour a large number of common stomach worms also. In such cases drenching for stomach worm should be undertaken, and, as is well known, good results are to be expected.

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Feeding Hotel and Restaurant Refuse to Pigs.

A. A. RAMSAY, Chief Chemist, and C. J. SANDERSON, Senior Veterinary Surgeon.

IN investigating the cause of considerable mortality among young pigs, attention became directed to the feeding of the animals, as it was quite apparent that, apart from the active state of disease which existed, and which was responsible for the majority of the deaths, a definite state of malnutrition also existed. The breeding sows were distinctly undernourished, and had very little milk, and as a result the pigs born were weak and frequently succumbed within a few days of birth, while the survivors appeared unthrifty and were very susceptible to disease. It was noticed that the pigs when weaned did not make progress in growth as they should have done, and certainly did not average ½ to ¾ lb. daily increase in weight, as should have occurred if they had been correctly fed. The pigs were fed exclusively on refuse obtained from hotels, restaurants, and greengrocers, and in order to arrive at the exact composition of the ration, samples of the swill fed to the pigs were taken and subjected to analysis. The result is given below:—

ANALYSIS of the Swill Fed to the Pigs.

	Sample as received	On moisture-free basis.
	per cent.	per cent.
Moisture	86·94	Nil
Ash*	1·08	8·25
Fat	2·43	18·60
Fibre	·02	·18
Crude protein	3 70	28·34
Carbohydrates	5·83	44·63
Total	100·00	100·00
Nutritive value	11·88	91·53
Albuminoid ratio	1 : 2·21	1 : 2·2
***Ash containing—**		
Lime	0·06	0·43
Phosphoric acid	0·19	1·48

***Percentage composition of ash—**

Lime (CaO)	5·51	per cent.
Phosphoric Acid (P_2O_5) ...	17·91	,,
Not determined	76·58	,,
	100·00	,,

On the assumption that each pig consumed 10 lb. of the mixture as submitted, each pig would receive the following amounts of digestible nutrients:—

Dry matter.	Crude protein.	Fat.	Carbo-hydrates.	Starch equivalent.	Effective albuminoid ratio	Lime (CaO).	Phosphoric acid. (P_2O_5)
lb.	lb.	lb.	lb.	lb.		grams.	grams.
1·10	·30	·19	·53	1·27	1 to 3·2	2·7	8·6

The standard ration for pigs (according to Klimmer*) is as follows, and is given for purpose of comparison:—

Age.	Dry matter.	Crude protein	Fat.	Carbo-hydrates.	Starch equivalent	Effective albuminoid ratio	Lime (CaO).	Phosphoric acid (P_2O_5).
	lb.	lb.	lb.	lb.	lb.		grams	grams.
2 to 3 months	1·76	·25	·04	1·12	1·43	1 to 4·8	2·8	2·7
3 to 5 months	3·6	·4 to ·45	·08 to ·09	2·35 to 2·40	2·9 to 3·0	1 to 6·0	2·8	2·7

The result of the analysis shows that the ration fed is definitely unbalanced. The amount of dry matter fed is insufficient, and is only 62.5 per cent. of that normally required. The amount of protein fed is adequate, but the amount of fat is more than four times that required, while the carbohydrate is only about half that normally required. The amount of calcium fed is very slightly less than experience indicates to be necessary.

If the quantities of the mixture being fed were increased in each case to enable the necessary amount of dry matter being ingested, then 16 lb. of the ration would be required. In this case the pigs would be receiving nearly one and a half times too much protein and six or seven times too much fat, while the carbohydrates furnished would still be 25 per cent. less than minimal requirements.

As a very large number of pig-farmers feed almost exclusively on hotel and restaurant refuse it was decided to extend the scope of the investigation in order to obtain some further information on the feed value of such refuse. Several other samples of feed were, therefore, obtained from pig-farmers in different localities, care being taken that the swill was stirred for some minutes in order to get a uniform sample. The results of some of these analyses are given below:—

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*KLIMMER, M.—Professor, Hygiene and Feeding, Veterinary College, Dresden (1923).

ANALYSES of Samples of Swill from Different Localities.

	No. 1.		No. 2.		No. 3.	
	Sample as received.	On moisture-free basis.	Sample as received.	On moisture-free basis.	Sample as received.	On moisture-free basis.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Moisture	87·97	......	88·52	......	92·99	......
Ash*	·65	5·38	·78	6·80	·57	8·12
Fat	2·67	22·20	1·35	11·74	1·68	24·02
Fibre	·13	1·12	·44	3·84	·07	1·00
Crude protein	2·75	22·82	1·61	14·00	2·12	30·26
Carbohydrates	5·83	48·48	7·30	63·62	2·57	36·60
Total	100·00	100·00	100·00	100·00	100·00	100·00
Nutritive value	14·58	121·25	11·94	104·03	8·47	120·9
Albuminoid ratio	1 : 4·3	1 : 4·3	1 : 6·4	1 : 6·4	1 : 2·9	1 : 2·9
*Ash containing— ...						
Lime	·07	·58	·08	·72	·03	·49
Phosphoric acid	·07	·58	·04	·36	·03	·48
*Percentage composition of ash—	per cent.		per cent.		per cent.	
Lime	10·8		10·6		6·03	
Phosphoric acid	10·8		5·3		5·91	
Not determined	78·4		84·1		88·06	

The three food mixtures (swill) analysed are quite unbalanced and are quite unsuitable food for pigs two to three months old, and still more unsuitable for pigs three to five months old. Assuming that pigs two to three months old consumed a gallon of the swill, the digestible dry matter in No. 1 would only amount to 51.7 per cent. (about one-half), in No. 2 to 49.4 per cent. (about one-half), and in No. 3 to 30.1 per cent. (about one-third) of that required by the standard ration. Digestible "crude protein" in No. 1 amounts to 88 per cent., in No. 2 to 52 per cent., and in No. 3 to 68 per cent. of the standard ration.

An outstanding feature of all samples is the abnormally high fat content. The amount of digestible "fat" in No. 1 is four and a quarter times, in No. 2 one and three-quarter times, and in No. 3 two and a quarter times more than required by standard. The digestible carbohydrates in No. 1 amount to only 47.7 per cent. (less than one-half), in No. 2 to 60.3 per cent. (less than two-thirds), and in No. 3 to 20.7 per cent. (about one-fifth) of the necessary amount.

The albuminoid ratio in No. 1 is satisfactory, in No. 2 is much too wide, and in No. 3 too narrow.

With regard to mineral constituents, lime and phosphoric acid, there is a slight excess of both in No. 1; in No. 2 there is an excess of lime (30 per cent.) and a deficiency of phosphoric acid (33 per cent.), while in No. 3 there is a deficiency of phosphoric acid and lime, only half the amounts necessary being furnished.

If the swills were ingested in quantities sufficient to provide the minimum requirements of digestible crude protein, 11.4 lb., 19.2 lb., and 14.7 lb. of Nos. 1, 2 and 3, respectively, would be required. The amount of dry matter in these weights would, however, be insufficient. The amount of digestible fat would be too high in all cases, and the amount of digestible carbohydrates in No. 1 would still only amount to slightly more than one-half of that required, and in No. 3 about one-third of normal requirements; No. 2 would contain an excess of carbohydrates.

General Conclusions.

A consideration of these and other analyses reveals the fact that hotel and restaurant refuse, when used as a sole ration for pigs, is unsuitable, as it is invariably an unbalanced one. This is unfortunate, as there is a very great amount of good pig feed to be obtained from refuse, provided means can be found to utilise it on sound nutritional lines.

It may be explained that kitchen refuse is used extensively in other parts of the world as an adjunct to foods of known composition and proved feeding value for pigs. Its use, however, appears to be generally recognised as a feed destined to furnish nitrogenous material principally, and this the analyses carried out by one of us (A.A.R.) shows to be correct. Pig feeders in this State do not appear to have recognised this fact, and have failed in consequence to utilise the refuse to the best advantage.

From the investigations so far carried out it appears that the common factor in all analyses shows that the swill contains far too much fluid, fat and protein, and too little carbohydrates, lime and phosphoric acid. The excess fluid is due to the pig-feeders' desire to render the feed "less strong," as several of them have put it.

As will be seen from a consideration of the table of analyses, it is impossible to suggest any certain means of converting feed of such divergent nutritive values into a uniform balanced ration.

As previously pointed out, it has been found that the majority of samples of food examined showed certain nutritional defects, and accordingly it has been suggested to feeders of refuse that they should reduce the water added to the swill by at least one-third, skim off the fat after boiling, and add crushed wheat in the proportion of 3 lb. to the gallon. In addition, an ounce of sterilised bonemeal and an equal quantity of salt should be added to each 30 gallons of swill. The use of green feeds in the raw state has also been advocated.

It is frankly admitted that the above suggestions are but a crude attempt to balance the ration, and the result of the advice given will be watched with interest. Further work on the feeding of refuse to pigs is proceeding.

The Causes of Second-grade Cream.

E. O. DALGLEISH, H.D.D., Senior Dairy Instructor.

THE first inquiry a dairy-farmer makes when his cream is classed as second quality is "What is the cause of it?" Very often the factory grader or dairy instructor cannot say definitely, and it is only by a visit to the farm that the causes may be traced.

With a view to helping farmers to discover for themselves the causes of poor quality, the following list of fifty known causes of second-grade cream has been compiled. While it is quite possible that several of the reasons stated may not be of themselves sufficient always to cause trouble, two or three of them in combination may be responsible. There are undoubtedly many causes of second quality, and there is also an infinitely greater variety of flavours in the cream produced. It is only by many years of experience that a cream grader can pick out flavours and definitely state the cause or causes of them.

The farmer who avoids the wrong practices enumerated in the following list should never have any trouble with cream quality. Some of them may seem unnecessary to the practical dairyman, but it is all a matter of system, and the suggestion is made that it is just as easy to do things properly as to slum them over. The fact that many hundreds of dairy-farmers make no effort to follow a good system and seldom have cream graded out has no bearing on the question. The cream supplied by these farmers is usually very indifferent—a "border line" cream classed as choice only through the leniency of the grader—and likely to be graded out at any time. Nothing but the best is wanted at the factories, and in the present period of low prices and financial difficulties farmers can only obtain maximum returns for their cream by supplying a maximum of choicest quality.

The Cow as a Cause.

Low quality in cream may be caused by using milk from cows (1) too soon after calving; (2) in calf and far advanced in lactation; (3) that have aborted; (4) suffering from mammitis; (5) that have not "cleaned up" after calving; (6) "on heat"; (7) suffering from any form of disease or ill-health.

The Feed and Water.

Feed taints are as a rule not serious enough to lower cream to second grade. Some of them, however, do have this effect, among the most common being those caused when the cows are allowed to feed on (1) carrot weed; (2) stinking roger; (3) lantana, brush vines, etc.

Water containing objectionable odours or taints may, if consumed by milking cows, transmit those taints to the milk. The herd should only be allowed to drink untainted, pure water, and should not be allowed to wade in swamps, bogs or stagnant waterholes.

Milking Methods that Result in Second Quality Cream.

Second-grade taints are introduced by:—

(1) Failing to wash the hands regularly and frequently while milking, and to change the water as soon as dirty.

(2) Failing to wipe the cow's udder free of dust, mud and manure, and to wash the teats prior to milking, preferably with water to which a little hypochlorite has been added.

(3) Using unclean cloths for cow's udders, or dirty towels for milker's hands.

(4) Failing to discard the first few squirts of milk from each teat.

Handling and Separating.

Trouble here may be caused by:—

(1) Straining milk through cloth or unclean gauze strainers.

(2) Allowing milk to stand in untinned or rusty cans and buckets.

(3) Separating only once per day.

(4) Skimming cream too thin or too thick.

(5) Using excessive quantities of skim-milk to flush out the separator bowl.

(6) Failure to wash the separator each time it is used.

The Care of Cream on the Farm and in Transit.

Second-quality cream may be caused by:—

(1) Failing to stir cream with a metal stirrer.

(2) Failing to blend each separating as soon as cool.

(3) Keeping cream in untinned or rusty receptacles and unsuitable containers, such as benzine tins—the can in which the cream is to go to the factory is the best container to store cream in.

(4) Failing to send in the morning's separating on cream-delivery day.

(5) Keeping small quantities of cream back and sending in next cream-delivery day.

(6) Failing to protect cream in the dairy from flies and vermin.

(7) Mixing warm cream with cold.

(8) Failing to keep cream cool whilst in the dairy.

(9) Exposure of cans to the direct rays of the sun, either on carts, at roadside, or on vans and launches *en route* to the factory.

Inefficient Washing of Utensils.

This is by far the most common reason for poor results, the causes of which are due to:—

(1) Failing to wash up twice daily.

(2) Washing up with cold water, either once or twice per day.

(3) Leaving the separator unwashed at night.

(4) Failing to use washing soda to remove grease from utensils.

(5) Using objectionable cloths or unclean brushes for washing up.

(6) Failing to scald thoroughly all utensils, brushes, etc., after washing.

(7) Failing to wash and scald cans on their return from the factory.

(8) Washing up utensils in polluted water—rainwater is always preferable.

The Yards, Bails, and Dairy.

Trouble is sometimes caused by:—

(1) Failing to wash down the bails.

(2) Washing dairy or separating room floor with water the utensils have been washed in.

(3) Failing to remove manure from the vicinity of yards and bails.

(4) Dust from unswept yards and bails contaminating milk while milking.

Lack of Care of Utensils, Separator, etc.

Second-grade cream has been found to be due to:—

(1) A leaking separator float.

(2) Rusty or untinned spots on any surface exposed to milk or cream.

(3) Cracks and open seams in any vessels such as cans, buckets, separator spouts, etc.

(4) Use of benzine tins for storing cream if the seams have not been flush soldered.

Milking Machines.

Owners of milking machine plants often experience much trouble with second-grade cream. Frequent causes of trouble are:—

(1) Failing to clean the air line and vacuum tank—the air line should be cleaned right back to the pump.

(2) Using old and worn-out rubbers and inflations

(3) Failing to pull the machines down and wash regularly.

(4) Failing to sterilise regularly the machines before use.

It is better to pull down and thoroughly wash one set of teat cups every day, than to do all of them one day per week. Sodium hypochlorite, sold under trade names, has been found an efficient steriliser, but should only be used according to directions—preferably drawn through the plant from fifteen to twenty minutes before milking.

Exhaust fumes from engines will cause second quality in cream; engine exhausts should be carried well above the eaves of the building.

The odours of benzine or kerosene will also taint cream if they are allowed to remain in the separator room.

Check Your Methods.

Each of the practices mentioned has at some time or other been definitely the cause of a farmer's cream being graded out. Admittedly some of the faults are far more common than others, but the farmer who is in trouble with his cream is recommended to go through the list, find out which methods are practised in his own dairy, and then apply the remedy.

There is a great tendency among dairy-farmers to copy each other's dairy methods, and sometimes lax methods have a tendency to spread. There is an old saying that two wrongs do not make a right, and this applies just as much to dairy methods as to anything else. Each of the practices in the preceding list is looked upon as wrong if the production of a good, clean-flavoured choicest cream is desired, and it should be desired by every dairy-farmer who has his own interest and that of the dairying industry at heart.

TUBERCLE-FREE HERDS.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Wolaroi College, Orange	10	4 Oct., 1931
Riverstone Meat Co., Riverstone Meat Works, Riverstone	104	11 ,, 1931
E. S. Cameron, Big Plain, Narrandera	28	14 ,, 1931
A. L. Logue, Thornbro, Muswellbrook	41	14 ,, 1931
Wagga Experiment Farm (Jerseys)	55	14 ,, 1931
J. L. W. Barton, Wallerawang	17	17 ,, 1931
J. F. Dowe, "Woolomol," Tamworth	59	19 ,, 1931
S. L. Wills, Greendale Dairy, Cowra	87	19 ,, 1931
St. Patrick's College, Goulburn	8	22 ,, 1931
Newington State Hospital and Home	108	24 ,, 1931
A. H. Webb, Quarry-road, Ryde	4	24 ,, 1931
Sacred Heart Convent, Bowral	10	26 ,, 1931
J. F. Chaffey, Glen Innes (Ayrshires)	75	4 Nov., 1931
Lunacy Department, Callan Park Mental Hospital	29	13 ,, 1931
J. Davies, Puen Buen, Scone (Jerseys)	85	14 ,, 1931
Wollongbar Experiment Farm, Lismore (Guernseys)	129	21 ,, 1931
Tamworth District Hospital	7	24 ,, 1931
Department of Education, Brush Farm, Eastwood	6	9 Dec., 1931
Bathurst Experiment Farm (Jerseys)	21	16 ,, 1931
H. A. Corderoy, Wyuna Park, Comboyne (Guernseys)	59	8 Jan., 1932
New England Girls' Grammar School, Armidale	29	10 ,, 1932
C. J. Parbery, Allawah, Bega	119	10 ,, 1932
New England Experiment Farm, Glen Innes (Ayrshires)	37	12 ,, 1932
W. Spindler, Mt. Pleasant, Bega	66	15 ,, 1932
W. T. Herbert, Racecourse Farm, Bega	68	18 ,, 1932
R. C. Dickson, Elwaton, Castle Hill (Jerseys)	17	20 ,, 1932
Lunacy Department, Morisset Mental Hospital	22	23 ,, 1932
Lidcombe State Hospital and Home	146	11 Feb., 1932
Riverina Welfare Farm, Yanco	77	25 ,, 1932
Department of Education, Yanco Agricultural High School	33	26 ,, 1932
W. M. McLean, Five Islands Road, Unanderra	78	27 ,, 1932
Mittagong Farm Homes	46	8 Mar., 1932
George Rose, Aylmerton	4	4 ,, 1932
Kinross Bros., Minnamurra, Inverell (Guernseys)	66	5 ,, 1932
P. M. Burtenshaw, Killean, Inverell	50	5 ,, 1932
Miss Brennan, Arankamp, Bowral	10	6 ,, 1932
Koyong School, Moss Vale	4	12 ,, 1932
G. A. Parish, Jerseyland, Berry	123	13 ,, 1932
Lunacy Department, Parramatta Mental Hospital	33	16 ,, 1932
Cowra Experiment Farm	32	24 ,, 1932
Hawkesbury Agricultural College (Jerseys)	115	25 ,, 1932
Russell Lamrock, Orange	4	26 ,, 1932
St. Joseph's Convent, Reynold-street, Goulburn	3	26 ,, 1932
St. John's Boys Orphanage, Goulburn	9	26 ,, 1932
Marion Hill Convent of Mercy, Goulburn	9	26 ,, 1932
Lunacy Department, Kenmore Mental Hospital	79	27 ,, 1932
St. Joseph's Girls Orphanage, Kenmore	9	27 ,, 1932
J. P. McQuillan, Bethungra Hotel, Bethungra	14	1 April, 1932
St. Michael's Novitiate, Goulburn	5	26 ,, 1932
James Wilkins, Jerseyville, Muswellbrook	39	28 ,, 1932
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	205	29 ,, 1932
Tudor House School, Moss Vale	8	3 May, 1932
Australian Missionary College, Cooranbong	53	6 ,, 1932
Navua Ltd., Grose Wold, via Richmond (Jerseys)	16	13 ,, 1932
E. C. Nicholson, Jillamatong, Corowa	184	2 June, 1932
Grafton Experiment Farm (Ayrshires)	194	4 ,, 1932
Hurlstone Agricultural High School, Glenfield	53	9 ,, 1932
P. Ubrihien, Corridgeree, Bega	133	8 July 1932
St. John's College, Woodlawn, Lismore	32	11 ,, 1932
Gladesville Mental Hospital	40	14 ,, 1932
William Thompson Masonic School, Baulkham Hills	16	16 ,, 1932
W. Hammond, Bellingen	68	16 ,, 1932
Chapman Bros., Farm 166, Stoney Point, Leeton	19	28 ,, 1932
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	13 Aug. 1932
W. S. Turnbull, Flanders Avenue, Muswellbrook	32	14 ,, 1932
E. E. Winder, Wybong Road, Muswellbrook	46	14 ,, 1932
A. Shaw, Barrington (Milking Shorthorns)	100	20 ,, 1932
E. E. McMullen, Springbrook, Holbrook	32	25 ,, 1932
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 ,, 1932
Department of Education, Gosford Farm Homes	38	2 Sept., 1932
James McCormack, Tumut	98	9 ,, 1932
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1932

—MAX HENRY, Chief Veterinary Surgeon.

The Water Content of Butter.

SOME FACTORS INFLUENCING THE ACCURACY OF TESTING METHODS.

A. M. BROWN, Special Dairy Instructor and Senior Grader.*

THE practice of testing butter for water content has received more general attention in the factories of New South Wales during the past season than ever before. In numbers of cases, however, the results of the tests at the factories have differed considerably from those obtained in Sydney, although the samples have been taken from the same churn of butter. These occurrences have, on occasions, given rise to expressions of dissatisfaction, or at least to some queries as to the cause on the part of those concerned. These variations in results constitute a problem of very long standing, the solving of which at the moment appears to present almost insurmountable difficulties The reason for this can be easily understood when it is considered what numerous and varied factors may either directly or indirectly affect the accuracy of these tests.

The following paper discusses some at least of these factors with a view to emphasising the fact of their existence, and so reminding those concerned of the necessity for overcoming them, or at least minimising their effect.

The Difficulty in Obtaining Thoroughly Representative Samples.

This item constitutes the initial cause of variations in the figures obtained by different operators. Thoroughly representative samples of a churn of butter can only be secured when the moisture has been evenly and thoroughly incorporated. Experiments carried out by the field staff of the Dairy Branch indicate clearly that even when moisture incorporation appears to be satisfactory a considerable difference frequently exists in the water content of butter at different parts of the churn. These differences may range up to as much as 1 per cent.

While there are a number of known factors which may account for this, such as the set of the churn, improper meshing of the rollers, etc., it was decided to carry out experiments for the purpose of investigating a theory that the method of adding the cold wash water might have some bearing on the matter, it being considered likely that when this water is allowed to fall directly on to one portion of the granular butter these particular grains become relatively harder at and around that place than at other parts of the churn, and thus make the incorporation of moisture more difficult, even when the harder grains are distributed throughout the mass of butter.

A number of comparative tests for moisture content were, therefore, made of samples taken from different parts of the butter in the churn:—(*a*) When the cold water was run directly on to one particular place in the granular mass, and (*b*) when the cold water was sprayed into the churn so as to produce a comparatively more even hardness of the granules.

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* Paper read at the Conference of The Dairy Factory Managers and Secretaries' Association of New South Wales, 1931.

The result of these tests indicated that while the finished butter treated as in (*b*) generally showed a lesser margin of difference than when procedure as in (*a*) was followed, the results were irregular under each treatment, and the figures were not conclusive enough to prove that the method of adding the cold wash water had any definite bearing on the irregularity in moisture content at different parts of the churn.

Free Moisture Creates Difficulties.

Of course, if free moisture is present the task of obtaining thoroughly representative samples is practically impossible, and under these circumstances not only would the calculations of the butter-maker who is desirous of incorporating the full amount of moisture be upset, but it would, no doubt, be found that the factory tests and any check tests carried out would show considerable variation in every instance.

From the foregoing it will be realised what a difficult matter it is to obtain sufficiently satisfactory samples to give exactly comparable results when butter from the same churn or even the same box is tested for moisture at different centres by different operators.

The Laboratory Method is not Practicable.

The whole of these facts serve to demonstrate another phase of the importance attached to the proper incorporation of moisture. Were it possible to carry out all tests for water content at the factories by means of the approved chemical laboratory method, and also to have all the checking done in a similar manner, much more comparable and accurate results should be obtained, but the practice of this method, particularly from a factory point of view, would be impossible (1) on account of the time occupied in making the tests; (2) on account of the factory hands who carry out this work possessing insufficient knowledge, skill, and practice to apply the method successfully.

In the laboratory method roughly about five hours are required to do one individual sample. Although large numbers of samples may be dealt with simultaneously, this does not meet the requirements when individual tests have to be made while the butter is still held in the churn pending the result of the test. The time factor alone renders its use impracticable. Then, again, features of the laboratory method, such as the emulsification of the sample and the correct and skilful manipulation of the extremely sensitive chemical balance, each call for the special training and practice possessed by a chemist or specially-trained operator. Ordinary factory employees do not hold these qualifications, although some, notably those who have gone through either the Dairy Diploma or Dairy Produce Manufacturing courses at Hawkesbury Agricultural College have had at least some training in this method.

The Quick Moisture Testing Method.

What is known as the "quick moisture testing method" is now used in all factories for testing butter for water content, as it overcomes the two features which make the use of laboratory methods impracticable in factory work. It is infinitely quicker and it does not require a great amount of skill and knowledge. With careful operation, results obtained, although, of course, not as accurate, are sufficiently so to make this test the only satisfactory substitute yet found for the laboratory method.

The Department of Agriculture has gone to considerable trouble during recent years to instruct factory employees in the correct manner in which to use the quick moisture testing outfit. Two qualified chemists from the Chemist's Branch were sent out to the principal dairying districts of this State for the purpose of trying out and where necessary adjusting the balances used in the different factories visited, and meanwhile to give expert instruction in the use of same, as well as in the general application of the method. The Chief Chemist has published a special article dealing with chemical control in butter factories in which this matter was most fully dealt with (*Agricultural Gazette,* vol. 29 (1928), page 909), and in addition dairy instructors attached to the Dairy Branch have given instruction in the course of their routine work and in response to special requests, so that factory employees should, if they have taken the trouble to avail themselves of the knowledge thus imparted, be well acquainted with the details of the method and it should not be necessary to describe them here. It is, however, necessary to draw attention to certain features connected with the quick moisture testing method which have come under notice at different times, and which may cause irregular and incorrect results.

A Loose Adjusting Nut.

In connection with the Fucoma balance, which is one of the machines used in factories, it sometimes happens that the adjusting nut for correctly balancing the beam becomes loose. This nut appears to be made of brass, and with constant use it often wears loose to such a degree that the slightest bump or touch will cause it to turn either way, and it is almost an impossibility to avoid a certain amount of bumping when counterpoising during the adding of the butter to the pans and in manipulating the weights after the moisture has been driven off. A tight adjusting nut is most necessary when using the Fucoma balance.

Weighing Samples when Hot after Moisture is Driven Off.

To save time it is often the practice to weigh the dishes when they are hot after the water has been expelled and an allowance made of from .2 to .4 per cent. for the radiation of heat. This procedure is obviously wrong. The dish containing the melted butter will be at different temperatures when weighed, and, therefore, the amount of radiation will vary, so that it is not possible, in these circumstances, to fix a reliable figure for allowance. The amount of radiation would not be quite so variable when an electric hot plate or hot sand bath is used for expelling the water from the butter as would be the case when the direct single flame is used, as the heat can be applied much more regularly in the former instances than in the latter.

Much more satisfactory results can be obtained by weighing the samples when cold. The cooling can be done in the ordinary way, but preferably in a desiccator. This operation has also been successfully carried out by immersing the lower part of the dishes containing the hot butter-fat in cold water until they are completely cooled, and then thoroughly drying them with a clean dry cloth before weighing. Some objection may possibly be raised to this latter procedure, as it somewhat lends itself to carelessness on the part of the operator. However, the human element cannot be altogether eliminated in the factory, and, therefore, the most suitable and careful employee should be selected for the work.

Ill-cared-for Balance and other Apparatus.

If the balance is in an uncared-for condition and the dishes and weights left greasy and dirty, unsatisfactory results will occur. The balance should be brushed free from any accumulation of dust, and the weight of the beam and pans should be eased from the knife edges when not in use; with the Fucoma balance the beam can be taken off altogether and placed in a box.

In cleaning the aluminium dishes it is not advisable to use any alkali to remove the fat, as this substance sets up a chemical action on the metal and has the effect of slightly increasing or decreasing their weight.

Unsuitable Places in which Balances are Kept and Manipulated.

In regard to the location of the balance in the factory, quite an amount of reform is necessary. All balances used in connection with the so-called quick moisture testing method are very sensitive to certain conditions, such as air draughts, vibration, and moisture, and their accuracy and satisfactory manipulation are, therefore, very easily impaired. These conditions often exist in the open churn rooms and test rooms in factories, but their effect could be nullified to a great extent if in the case of the former room, special convenient enclosures were provided for housing the balance as a guard against air draughts, and if in the case of the test room, a table or concrete stand separate from the testing bench was installed on which to place the instrument in order to do away with or greatly minimise the vibration consequent to the running of the testing machine. Cases should be provided for the balance as a protection against moisture.

The remaining items which affect the accuracy and regularity in moisture testing results are mostly due to errors in actual manipulation, which can be rectified by practice and by correctly applying the technique of the method under review, which should be familiar to those concerned.

With the exercise of the necessary care and the elimination of the several factors discussed above, together with the more general application of the standard method for ascertaining the water content of butter in factories, there appears to be no reason why results cannot be obtained which will be sufficiently comparable and accurate, for practical purposes at any rate.

Farm Forestry.

V. THE NATIVE AND INTRODUCED TREES OF NEW SOUTH WALES.

[Continued from page 558.]

R. H. ANDERSON, B.Sc.Agr., Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, University of Sydney.

THE COASTAL DIVISION—*continued.*

Native Trees of the Coastal Division—*continued.*

In addition to the species dealt with in previous articles, there are a number of trees or large shrubs of limited distribution or of minor importance.

The Whale Bone Tree (*Pseudomorus Brunoniana*) occurs as a small to medium-sized tree up to 50 feet in height in brushes from Illawarra to Queensland. The light brown, close-grained timber is hard and tough, and is sometimes used for axe and tool handles. It was employed by the blacks for making boomerangs. When grown as a specimen tree it forms a fairly symmetrical and dense head of foliage.

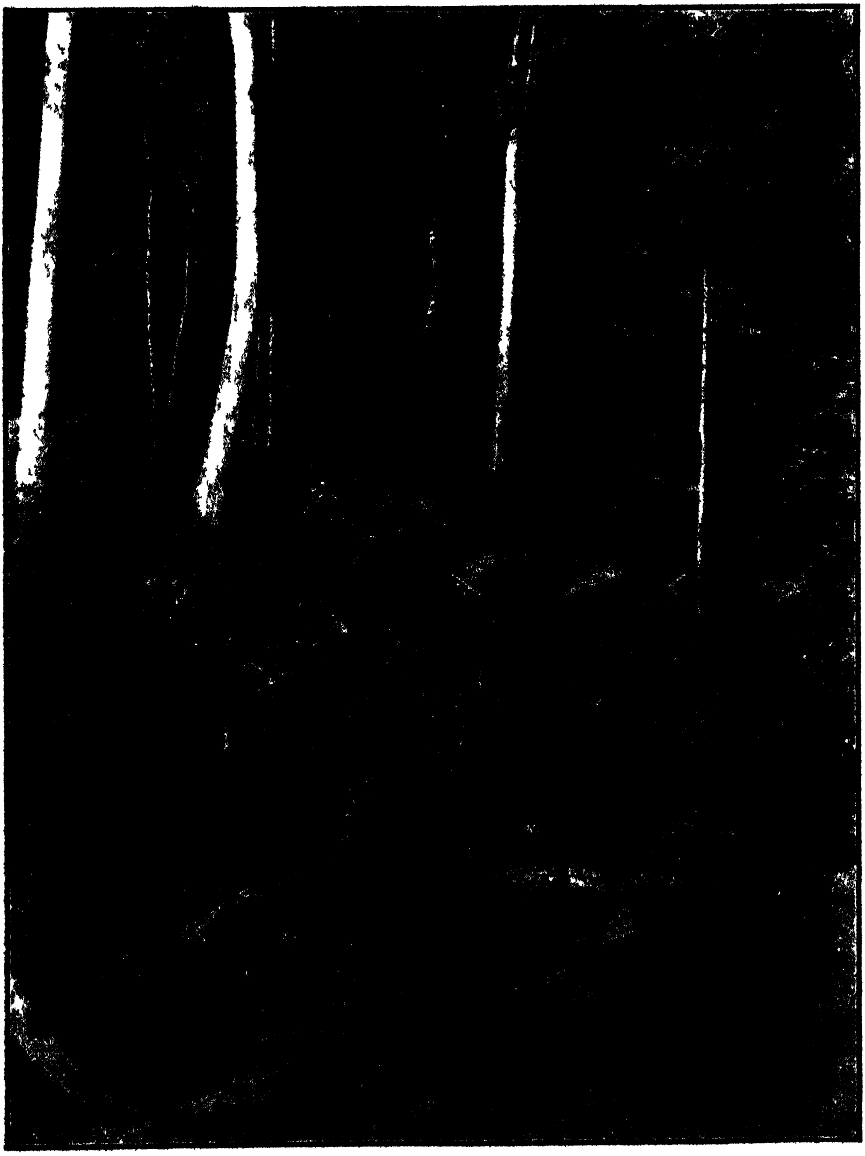
Celtis paniculata is an attractive looking tree found in a few localities in brush areas.

The Giant Stinging Tree (*Laportea gigas*) is a very large, partly deciduous tree, often well over 100 feet in height, found in brush lands from Bega to Queensland. The leaves are very large, more or less heart-shaped, and up to 12 inches in length. They, as well as the branchlets, are covered with stinging hairs which are very virulent, especially in the case of younger leaves. The timber is very soft, brownish in colour, and practically useless. The inner bark can be beaten into a sort of coarse cloth, the best fibre being obtained from the root bark. Aborigines are said to have made fishing nets and lines from the fibre. The tree is fairly common on rich, moist soil, and is generally regarded as a sign of good land.

The Small-leaved Stinging Tree (*Laportea photiniphylla*) also forms a fairly large tree, and is found in brushes both north and south of Sydney. The stinging hairs are much fewer than in the previous species, but are rather stouter and more rigid. The leaves are glossy on the upper surface and are usually 3 to 5 inches long.

The Native Peach or Peach-leaf Poison Bush (*Trema cannabina*) occurs as a shrub rarely exceeding 10 feet in height, mainly on good soil. The leaves are more or less peach-like, but the fruit is a very small black drupe. It has long been regarded as poisonous to stock and experiments have shown that at certain times it contains prussic acid, and if eaten in quantity may cause death. At other times, however, it is apparently harmless, and stock eat it freely without any ill-effect.

The Native Pear (*Xylomelum pyriforme*), with its curious woody fruit, is found as a shrub or small tree up to 25 feet in height in sandstone country from a little south of Sydney to Queensland.



A Typical Brush Scene.
Such areas are rich in timber-producing and ornamental trees.

A number of *Hakea* species occur in the Division, but these are mainly shrubs and seldom become arborescent.

ESTABLISHMENT *of* PASTURES

The young plants 'during root establishment cannot forage to any extent for plant food. It is therefore essential when seeding a pasture to use a balanced mixture of readily available fertiliser. When the clovers become established, they are able to fix their own nitrogen and require phosphate applications only. The grasses, however, become nitrogen starved during the cold months and show little growth unless supplied with this plant food. Consequently, for the production of a good " soil cover," the exclusion of weeds, and a balance between grasses and clovers, newly sown pastures should be fertilised as follows:—

A—IN AUTUMN AT SEEDING—
2 to 3 cwts. super per acre.
1 to 2 cwts. sulphate of ammonia per acre.

B—IN JULY—
1 to 1½ cwts. sulphate of ammonia per acre

Applications of nitrogen will, in addition, provide valuable Winter and early Spring feed

For further particulars apply

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Season 1931-32.

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WHEAT will be received on account of growers, millers, shippers, and others, at the following stations.—

Alectown West
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Ardlethan
Ariah Park
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Beckom
Belfrayden
Berrigan
Billimari
Binya
Bogan Gate
Boorowa
Boree Creek
Bribbaree
Brocklesby
Brushwood
Buddigower
Burrumbuttock
Calleen
Canowindra
Caragabal
Combaning
Coolamon
Culcairn
Cumnock
Cullivel
Cunningar
Curban
Erigolia
Eugowra
Eumungerie
Finley
Forbes
Ganmain
Garema
Geurie
Gidginbung
Gilgandra
Girral
Gooloogong North
Goonumbla
Greenethorpe
Grenfell
Grong Grong
Gunningbland
Harefield
Henty
Holbrook
Hopefield
Illabo
Kamarah
Ladysmith
Lockhart
Maimuru
Mangoplah
Manildra
Marinna
Marrar
Matong
Milbrulong
Milvale
Mirrool
Molong
Moombooldool
Munyabla
Narromine
Nelungaloo
Oaklands
Old Junee
Parkes
Peak Hill
Pucawan
Quandary
Quandialla
Rand
Reefton
Stockinbingal
Tallimba
Temora
The Rock
Tichborne
Tomingley West
Tootool
Trundle
Tullibigeal
Urana
Urangeline
Uranquinty
Ungarie
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Yiddah

NEW plants will be in operation at Belfrayden, Cunningar Gooloogong North, Ladysmith, Quandary, and Woodstock.

GROWERS should patronise the system which has been provided in their interests to enable them to effect considerable savings in the cost of handling their wheat, to ensure safe storage, and to eliminate the necessity for purchasing cornsacks

WHEAT may be delivered from clean second-hand cornsacks.

GROWERS at non-silo stations should consign their wheat in bulk trucks to the Terminal Elevator, Rozelle, at a reduced fee.

Inquiries are Invited.

2nd Floor, Department of Agriculture,
Raphael Street, Sydney.
Postal Address:
Box 36A, G.P.O., Sydney.

E. HARRIS,
Wheat Commissioner and
Manager, Govt. Grain Elevators.

The Willow-leaved Hakea (*Hakea saligna*) occasionally reaches 20 feet in height and the free-working, flesh-coloured timber is sometimes used for tool handles.

Hakea dactyloides is common in many parts, but seldom exceeds 12 feet in height.

Several Needle-leaved Hakeas occur, the most common being *Hakea acicularis*. In the National Park, Hawkesbury River, and Blue Mountains districts, *Hakea propinqua* occurs as a fairly tall shrub.

The Native Cherry (*Exocarpus cupressiformis*) forms a very attractive little tree with its graceful olive green foliage and dark rough bark (see also *Agricultural Gazette*, 1928, page 923).

The Bird-lime Tree (*Pisonia Brunoniana*) is a soft-wooded, small to medium-sized tree found in brushes from the Illawarra district to Queensland. The narrow, angular fruits exude a very viscid substance which tangles the feet or feathers of small birds.

The Bell-fruit Tree (*Codonocarpus australis*) forms a small cone shaped tree in brushlands from the Hunter River northwards

The Hard Bolly Gum (*Beilschmiedia obtusifolia*) is found in brushes in the northern part of the Division. It forms a large tree up to 150 feet in height, but is not a common species. The flowers are said to have an offensive odour.

Eupomatia laurina is a tall shrub or small tree fairly common in brushes both north and south of Sydney. It sometimes develops a semi-climbing habit In Victoria it is occasionally known as "Bolwarra."

Pentaceras australis is moderately plentiful in brushland northwards from the Richmond River. It is occasionally known as "Crow's Ash," and forms a small to medium-sized tree.

Lignum-vitae (*Vitex Lignum-vitae*) is mainly a Queensland tree, but is said to occur in the far northern portion of New South Wales. It is a large tree with a strong timber which is regarded as more durable than other brush species, and is therefore used occasionally for fencing posts. The allied species *Vitex trifoliata* is only a large shrub or small tree, and is found in the northern subdivision in the Tweed Heads and Lismore districts.

Myoporum insulare is a tall shrub or small tree up to 30 feet in height, but often dwarfed when occurring near the seacoast. It has a fleshy, purplish fruit It stands exposure well, and growing close to the sea helps to check erosion or drift.

Trochocarpa laurina is fairly common in the coastal brushes, forming a small tree or tall shrub, often with decorative, coloured tips.

The Native Elder (*Sambucus* sp.) forms a fairly attractive shrub or small tree, and the Native Mulberry (*Hedycarya angustifolia*) is a not uncommon shrub in sheltered sites. *Cuttsia viburnea* is also sometimes known as Elderberry. It is a small bushy tree, fairly plentiful in parts of the northern subdivision, especially on rich soil, and along watercourses.

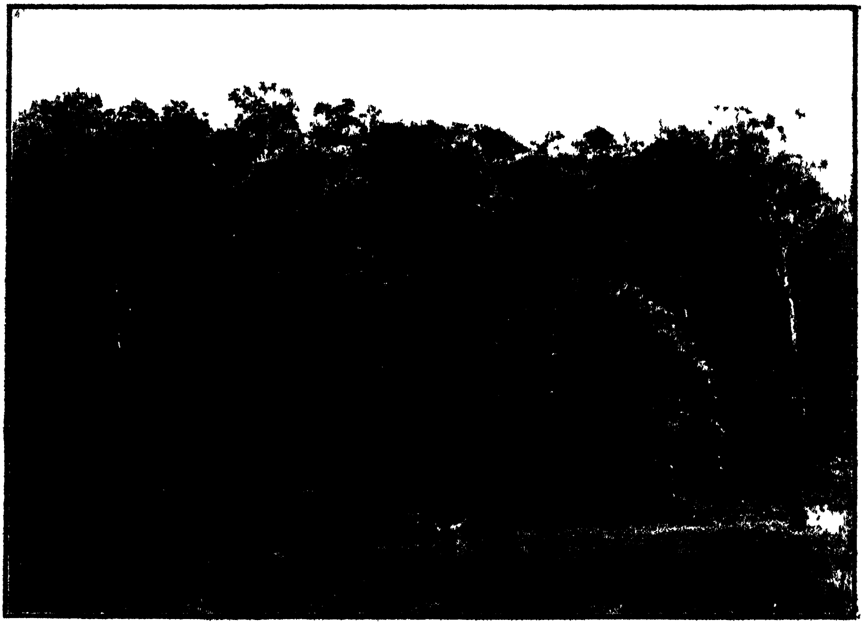
Some of the Geebungs (*Persoonia* spp.), common in sandstone country, occasionally grow into small trees, notably *Persoonia salicina* and *Persoonia linearis.*

WATTLES (*Acacia* spp.).

The various species of Wattle (*Acacia* spp.) constitute an interesting part of the coastal flora. They are found under a wide range of climatic and soil conditions, and vary in size from small undershrubs to medium-sized trees. The following are the more important species:—

Coast Myall (*Acacia glaucescens*).

An attractive small to medium-sized tree up to 50 feet in height, with rather rugged fibrous bark, found mainly along creeks and rivers and in rocky gullies in the southern and central subdivisions. It occurs from Tuross River in the south to Port Macquarie in the north, but is most common in the County of Cumberland along rivers such as the Nepean and George's. Here and there it ascends to the Tableland Division, but is essentially a coastal tree. It is also known as "Sally Wattle."



Coast Myall (*Acacia glaucescens*).

"Phyllodes (leaves) lanceolate, 4 to 6 inches long and striate with several longitudinal nerves, ashy-hued when fresh. Flowers in fluffy spikes 1½ to 2½ inches long. Pod straight, narrow, and 2 to 3 inches long."

Uses.—The species is a most ornamental one, especially in early spring when the fluffy spikes of flowers are produced in great abundance. The somewhat silvery and drooping foliage is also attractive. The hard, dark, close-grained timber is often attractively figured, and is occasionally employed for small cabinet work and turnery purposes. It is not, however, a timber tree. The bark is regarded as of no value for tanning purposes. Experiments have shown that the leaves contain a principle of prussic acid and are definitely poisonous to stock. Stock will not readily eat it, even when hungry, but nevertheless it does not appear advisable to plant this species in areas to which stock have access.

SYDNEY GOLDEN WATTLE (*Acacia longifolia*).

A shrub or small tree, rather variable in character, found throughout the Division and extending to the tablelands.

"Phyllodes (leaves) 2 to 6 inches long, marked with several longitudinal veins. Flowers in spikes 1 to 2 inches long. Pods very narrow, up to 5 inches long"

Uses.—The species is a moderately ornamental one, and is usually included in wattle collections. The timber is pale-coloured, fairly light and tough, but has no particular value. A form of this species is found commonly along sandy seashores both north and south of Sydney, forming a low spreading bush very different in habit from the ordinary form. Long, flexible, prostrate branches up to 6 or 7 feet in length spread out from the short stock and help greatly in binding the sand and preventing drift. It flourishes in practically pure sand quite close to the water, and is therefore a useful sand-binding plant. The leaves of this form are thicker and more fleshy than the normal form, but otherwise it has the same botanical features.

An allied species, *Acacia floribunda,* resembles the Sydney Golden Wattle, but has narrower leaves, and is usually more bushy and often rather larger in size, occasionally reaching 40 feet in height. It is an ornamental tree and is found fairly commonly in the Division, particularly along creeks and river banks. It is one of the several species known as "Sally."

MAIDEN'S WATTLE (*Acacia Maideni*).

A small to medium-sized tree found in many districts in the Division from the Illawarra northwards to Queensland.

"Phyllodes (leaves) fairly large with fine longitudinal veins. Flowers in spikes, which are solitary or in twos or threes. Pod narrow and much twisted."

Uses.—The tree is usually of good shape and well foliaged, although the pale yellow flowers are not very abundantly produced. The timber is inferior and of little importance.

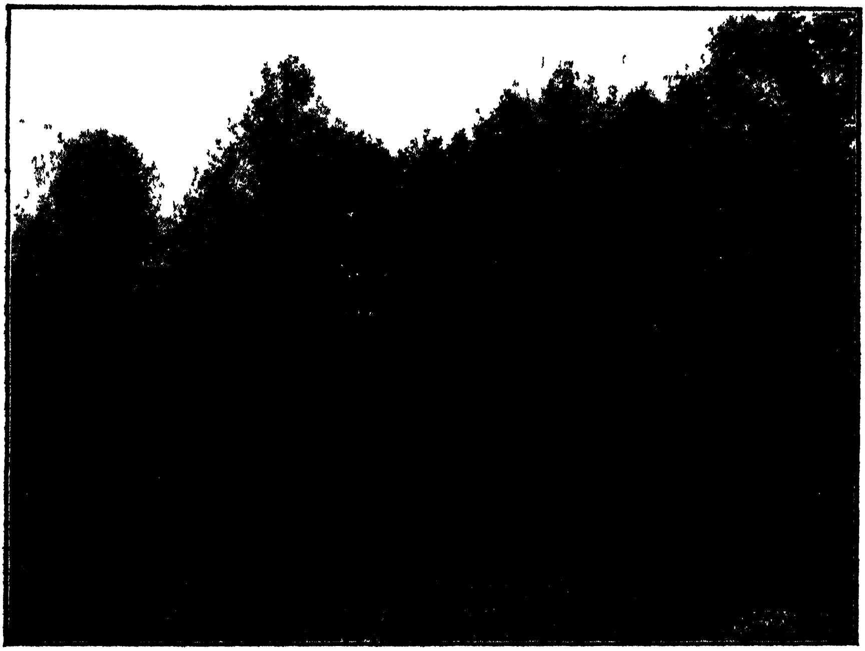
BLACK WATTLE (*Acacia decurrens*).

A small to medium-sized tree up to 40 feet in height, found mainly in the County of Cumberland, but also extending to the tablelands (see also *Agricultural Gazette,* 1929, page 784).

"Foliage green, without hairs, bipinnate (feather-leaved), the leaflets narrow, ⅓ to ½ inch long. Glands (seen as small protuberances on the rhachis) numerous. Pod flat, constricted between the seeds."

Uses.—Well grown trees are ornamental and of value for shelter. The bark contains a fair percentage of tannin. Like other wattles, it is rapid in growth, and in South Africa is planted for fuel and quick shelter.

The variety *pauciglandulosa,* which is generally known as "Green Wattle," is readily distinguished by the yellowish-green cast of the foliage and by the leaflets being smaller and closer together. The glands along the leaf-stalks are also very much reduced in number or altogether wanting.



A Group of Black Wattle (*Acacia decurrens*).

It forms a small to medium-sized tree, and is found from a little south of Sydney northwards to the Queensland border. The flowers are insignificant, but the soft green foliage is pleasing in appearance and the tree is of some value for shelter.

TWO-VEINED HICKORY (*Acacia binervata*).

A small to moderately large tree of good shape and well foliaged, found in a number of localities throughout the Division and lower mountain ranges, but most abundant and of best growth in the Illawarra district. It is occasionally known as "Black Wattle."

"Phyllodes (leaves) 3 to 5 inches long, with two well-marked veins. Flower-heads in short axillary racemes. Pod flat, 3 to 6 inches long and ¼ to ¾ inches wide."

Uses.—This is one of the large leafy types of wattle, and is useful for shade and shelter in a fairly wide range of soils. The timber is dirty pink in colour, rather light and tough, but is seldom used. The bark is fairly rich in tannic acid.

BAKER'S WATTLE (*Acacia Bakeri*).

This is one of the largest of the wattles, sometimes exceeding 100 feet in height. It is found on good soil in brushes at the northern end of the Division, and is sometimes known as "Marblewood."

"Phyllodes (leaves) 3-nerved, fairly broad and 3 to 4 inches in length. Flowers in dense heads in racemes. Pod long, straight, and flat."

Uses.—The timber is pale yellowish or cream-coloured, hard, fairly strong, and with a wide sapwood. So far it has been little used The tree is rather different in appearance from most wattles and is worthy of cultivation on better-class soils.

GOSFORD WATTLE (*Acacia prominens*).

A variable species as regards size, found in the Sydney, Nepean, and Gosford districts of the central subdivision. Although often only a small tree or tall shrub, it also forms a fine tree up to 60 feet in height, particularly in the Gosford district. The foliage is somewhat ashy-hued, giving rise to the local name of "Silver Wattle." It is also known as "Sally Wattle," but the vernacular name of Gosford Wattle is suggested as a more distinctive one.

"Phyllodes (leaves) 1½ to 2½ inches long, with a rather prominent gland on the edge towards the base. Flower heads in slender racemes often exceeding the leaves. Pods bluish, 1 to 2½ inches long."

Uses.—An ornamental species worthy of cultivation. The bark has tanning properties, but of an inferior character.

In addition to the above species, three wattles previously described (see *Agricultural Gazette,* November, 1929, pages 784-786), are also found in the Coastal Division. These are Hickory (*Acacia implexa*), Cedar Wattle (*Acacia elata*), and Broad-leaf Hickory (*Acacia falciformis*). The last-mentioned species is fairly plentiful on ridges and high land in the southern subdivision. Cedar Wattle is found in gullies in the Hawkesbury River district, and makes a fine tree under cultivation in other parts of the Division, even on rather poor sandy soil.

There are also a number of wattles of minor importance.

Acacia pruinosa occurs in rather sheltered positions, and, although often a rather straggly tree, is effective in appearance owing to the silvery leaves and branchlets. It occasionally reaches 50 feet in height.

Acacia aulacocarpa is found both in brushes and in open, rather poor country in the northern subdivision. It is up to 80 feet in height, slightly ashy in appearance, and is sometimes known as "Brush Ironbark." The timber is hard, heavy, dark red, and said to be durable.

Acacia falcata occurs as a shrub throughout the Division. It rarely exceeds 10 feet in height, and sometimes forms dense masses of growth on cleared country, especially in stony, but rather moist, soils.

Other wattles which are usually only shrubby in growth include *Acacia discolor, A. linearis, A. linifolia, A. suaveolens, A. myrtifolia, A. elongata, A. pubescens, A. armata* (Kangaroo Thorn), *A. pugioniformis, A. hispidula, A. undulifolia, A. stricta, A. Ruppii.*

A number of wattles not found naturally in the Division are frequently cultivated successfully. The most common of these are Cootamundra Wattle (*A. Baileyana*) and Queensland Silver Wattle (*A. podalyriaefolia*), both of which do very well and are useful ornamental and small shade trees.

(*To be continued.*)

MAIZE FERTILISER TRIALS ON THE SOUTH COAST.

SOUTH COAST farmers again co-operated with the Department of Agriculture last season in carrying out maize fertiliser trials.

The exceptionally good season, states Mr. R. N. Makin, Senior Agricultural Instructor, in reporting upon these trials, was responsible for record yields. Furthermore, the crops were not troubled to any extent by cob and stem rot or weevil.

In the grain fertiliser trial carried out by Mr. J. Chittick, Kangaroo Valley, on a medium sedimentary loam, superphosphate proved the best and cheapest fertiliser. The results were :—Superphosphate (2 cwt. per acre), 130 bushels per acre; basic superphosphate (2½ cwt. per acre), 126 bushels; a mixture of equal parts of superphosphate and bonedust (2 cwt. per acre), 121 bushels; and no manure, 117 bushels per acre. Boone County White was the variety used in the trial, which was sown on 21st October, and harvested on 20th May.

The following table gives the results of the maize green fodder fertiliser trials (Fitzroy was the variety used) :—

	Camden (J. W. Childs)		Albion Park (E. Mathie.)	
	tons.	cwt.	tons.	cwt.
Superphosphate (1 cwt. per acre)	27	17	38	11
Basic superphosphate (1½ cwt. per acre)	25	14	37	8
*M16 mixture (1½ cwt. per acre)	28	0	48	7
No manure	21	8	31	8
Sown	5–12–30		10–10–30	
Harvested	9–4–31		4–3–31	

* A mixture of ten parts superphosphate and three parts sulphate of ammonia.

The M16 mixture, which gave the best results at both centres, has demonstrated its superiority on Mr. Childs' farm for several years now. All fertilisers, it will be noted, gave increases over the unmanured plots.

Burbank's Plums and Prunes in New South Wales.

J. M. ARTHUR, Orchardist, and N. S. SHIRLOW, B.Sc.Agr., Assistant Plant Breeder, Hawkesbury Agricultural College.

THE name of Luther Burbank is known to most people who are interested in horticulture as the originator of several new varieties of flowers and fruits. Burbank was a pioneer in plant breeding in many respects, and was successful in evolving many new creations in plant life. He was a practical breeder, more concerned in producing economic results than in advancing the scientific methods of breeding which would be helpful to himself and others as a foundation in further breeding work. In other words, Burbank was not a student of the laws of inheritance in his breeding work, ignoring these largely in his practical quest for new forms by diligent search through large numbers of individuals in the hope or chance of securing the desired end. His name will be long remembered and best revered for the new varieties of plums, which have been an important contribution to the fruit-growing world from an economic standpoint.

Burbank and Plant Introduction.

Burbank was highly imbued with the importance of plant introduction from other countries as an aid in his plant-breeding work, and one day in a public library in San Francisco, while glancing through a travel book of an American sailor in Japan, his attention was arrested by the mention of a plum with red flesh. At that time, red-fleshed plums were unknown in America, most of the varieties grown being the domestica or European plums, all of which have yellow flesh. Burbank immediately arranged to get some seedlings of this "blood" plum, which the sailor had seen and eaten in the province of Satsuma, in Southern Japan. In 1885, therefore, a shipment of twelve seedlings from this "blood" plum was successfully made by Burbank to California.

Two of these seedlings produced such excellent fruit that they were offered to the public as new plum varieties under the names of Burbank and Satsuma. As most plant-breeders know, and as Burbank himself readily admitted, he was remarkably fortunate in getting two such admirable varieties from only twelve chance seedlings, thousands of seedling trees usually having to be grown subsequently by Burbank and other plant-breeders to get one or two new varieties of value. Those who are inclined to scoff at Burbank claiming the credit of breeding these two new plums lose sight of the fact that one of the most important phases of a plant-breeder's work is systematic plant introduction, which to be most valuable demands much trouble and initiative. It is for this that Burbank must be given due credit.

Further introductions and cross-breeding with these plums from Japan followed, and the original introduced Satsuma is the parent of all the red-fleshed plums now grown in America, from which country they have spread to South America, Africa, and other countries, including Australia. Among the additional varieties of red-fleshed plums, which were introduced as seedlings from Japan by Burbank are Apple, Beauty, Delaware, Duarte, Hermosillo, Prize, Rubio and Sultan. Abundance, Chabot, and Berkman's are also plums of oriental origin introduced by Burbank as seedlings. These, like the Burbank plum, are not red-fleshed. Kelsey is also a seedling plum, not red-fleshed, which was introduced from Japan, by an orchardist of that name in America, not by Burbank.

Crossbreeding Work with American and Japanese Plums.

In 1888 Burbank began crossbreeding with the introduced Japanese plums and with other plums. The Japanese plums belong to the species, *Prunus triflora* or *P. salicina*. The European plums all belong to *P. domestica*, and there are several native American species, the chief of which is *P. americana*. Another oriental species is the apricot plum of China (*P. simonii*).

Burbank first conceived the idea of crossing the Japanese plums with the European species. His object was to combine the large size of the European varieties with the quality and better handling or carrying properties of the Japanese sorts. He stated that it was not easy to effect this cross because some varieties refused to combine, mentioning that probably not more than one in a hundred of such crosses were satisfactory. In those cases in which Burbank considered he obtained fertilised fruits, he said that the traits of the Japanese plum usually seemed prepotent in most characters. Burbank was not a systematic or a scientific plant-breeder in that he seldom kept complete parental records of his crosses, nor did he biometrically study the inheritance of characters in the progeny. He stated that he was too busy to keep records of all the parentage of thousands of crosses that he made, and he was more concerned, as already stated, with the practical result than with observations or studies in inheritance which might assist future plant-breeders. It is therefore doubtful whether he was actually successful in crossing the Japanese and the European species, for it is known that no other breeder has ever been successful in crossing these species of plums. Moreover, the two species are incompatible as stocks, one for the other. Allen[1] states that it has recently been found in California that Tragedy, an early-blooming European variety, will effectively pollinate the Japanese varieties Beauty, Formosa, Gaviota, and Methley, but evidence is still required as to any successful cross-fertilisation between these species.

Burbank did, however, achieve success from other crosses. His Wickson plum was stated by him to be the result of crossing the Kelsey and the Burbank varieties. Gold, Shiro, Gee Whiz, Duarte, and America are Burbank productions obtained by using the wild American plums in crossing with the Japanese plums. These species cross successfully and Burbank stated that the above varieties owe their flavour largely to the American parent species. The varieties Maynard, Climax, Chalco, Santa Ross, and Formosa are stated by Burbank to contain blood of the Chinese apricot plum (*P. simonii*), which has choice quality and a high fragrance, and with which the Japanese plums also cross successfully. Burbank stated that 7,500,000 seedlings were raised and grown to get these few good varieties.

Our Best Japanese Plums Produced by Burbank.

Burbank was unable to give the exact parentage of most of these plums, but, as previously mentioned, nearly all the red-fleshed or "blood" plums among the Burbank creations contain the blood of Satsuma, the first red-fleshed plum introduced to America by Burbank. Of the foregoing varieties, Satsuma, Wickson, Shiro, Burbank, Santa Rosa and Climax are the chief varieties of Burbank's Japanese plums or Japanese hybrids grown in New South Wales. Some Burbank plums have not yet been tried in New South Wales, but many of these have not made much headway in America. However, Duarte and Beauty are now the leading varieties being planted in California, and these have been lately introduced for trial in New South Wales. The fact that the five leading varieties of Japanese plums grown in this State are Burbank's productions signifies the debt we owe to this American breeder.

Following are brief particulars of the chief varieties of Japanese or Japanese hybrid plums produced by Burbank:—

Satsuma.—Tree of a spreading to pendulous habit. Fruit of good size, with a red skin covered thickly with a pale bloom. The flesh is dark-purplish red, firm, of good flavour and dessert quality when allowed to ripen thoroughly. Blossoms very early and is of mid-season maturity. This variety bears light crops until the trees are well grown and is an alternate cropper, *i.e.*, bears heavily one year and a light crop the next. Although Satsuma is the leading variety in New South Wales, other Japanese plums are of a larger size and more attractive appearance on the market.

Wickson.—Trees vigorous and upright in growth. Very large fruit, of good flavour and quality, and a good variety for preserving in syrup for domestic use. A good shipping plum. Yellow skin with a pink blush and yellow flesh. It blossoms early and sometimes has a light crop from lack of pollen of other varieties, which is required for its pollination. Santa Rosa should be grown near it to supply this need.

Shiro.—Trees not of robust habit and inclined to an over-production of fruit spurs. Fruit of medium size with yellow skin and yellow flesh, a good regular cropper of fair quality, early maturing. Blossoms with October Purple and Chalco.

Burbank.—The tree has a semi-upright habit and is adapted to a varied range of climatic and other conditions. A heavy cropping variety, with fruit of medium to large size, of fair quality and a good shipping plum. The fruit has a yellow skin, mottled reddish, with firm yellow flesh, is juicy and has a small pit. It is self-sterile and requires other varieties near it for pollination. It is of mid-season maturity, a little later than Santa Rosa.

Santa Rosa.—The tree is of upright habit; the fruit is large with a purplish-crimson skin with a heavy bloom; the flesh when ripe is cherry-red colour, of very good quality and attractive flavour. It is a good shipping plum, not only on account of quality, but also as the skin keeps developing colour after picking. Blooms early, but later than Satsuma, and ripens early mid-season. The blossoms are partially self-fertile. Wickson blosssoms about the same time, and supplies the desirable pollen for fertilisation.

Climax.—The tree is vigorous; fruit large, but too soft to be satisfactory for shipping, and very liable to split; the skin is yellow with a reddish blush, flesh yellow, and the flavour good. An early variety with self-fertile blossoms.

Duarte.—The trees are vigorous and upright in growth; fruit very large; skin dull red, covered with brownish mottling; flesh dark red and of good flavour. A good shipping plum, and the earliest of the "blood" plums. Its blossoming period is late and it is self-sterile.

Beauty.—Trees vigorous and prolific; fruit of medium size; skin red, mottled with white, and flesh amber, streaked with scarlet. This variety is very attractive, and a good shipper for an early plum. One of the earliest maturing plums, and partially self-fertile.

Formosa.—Fruit very large, uniform in size, and of good quality. Skin pale yellow with a pale bloom when ripening, turning to a clear rich red. Flesh yellow, very firm, sweet, rich, with apricot flavour, and nearly freestone. Self-sterile and blossoming early, requiring Wickson and Santa Rosa for pollination. An early ripening and excellent shipping plum, inclined to be an alternate cropper, probably on account of pollination.

Gaviota.—Fruit large, heart-shaped, with dull red skin when fully ripe; flesh light yellow; a regular and heavy cropper of good quality. An excellent shipping plum, with very firm flesh, but rather late ripening. Blossoms are self-sterile and appear rather late.

October Purple, Wright's Early, and Kelsey are non-Burbank Japanese plums which are grown to some extent in New South Wales. Narrabeen, a Japanese plum of local origin, is also coming into prominence during the past few years.

The Plumcot.

Burbank also conceived the idea of crossing the plum with the apricot. He stated that the cross was successfully made only after a long series of experiments. As previously mentioned, Burbank did not keep exact records of the pedigrees of his new fruits, and the seedlings which he pronounced as plumcots came from the seeds of a Japanese plum, which he said had been pollenised with various apricot blossoms. Five of these were named Bearer, Rutland, Apex, Triumph, and Corona plumcots. Of these, the Apex is the best known, and has attained to the rank of a market variety to a small extent in America. This variety is as early as the earliest plums, and according to Burbank himself is like a plum in foliage, upright growth, productiveness, and smooth-skinned fruit, but resembles an apricot in shape and quality of fruit, the flesh being honey-yellow, firm, rich, aromatic, and sweet to taste.

Eminent horticulturists in America throw considerable doubt on the possibility of successfully crossing the plum and the apricot. Jones[1] points out that apricots and plums are related fruits belonging to the same genus, and tend to vary toward each other. One species of plum (*Prunus simonii*) is called the apricot plum of China. In tree characters it resembles the peach more than the other plums, and the fruit is as much like apricots or nectarines as plums. This species has been successfully crossed with the Japanese plum (*Prunus salicina*), and is systematically classed as a plum. In his own writings, Burbank himself throws doubt on the validity of the cross. He states that the seedlings of his plumcots all produce plumcots, none reverting to the true plum or the true apricot, but that the mixed heritage of the new fruit is not altogether obscured, the tendency to segregation of plum factors and apricot factors in the second and succeeding generations being variously manifested.

It is possible that the plumcots of Burbank derive their origin from the crossing of the Japanese plum (*P. salicina*) with the apricot plum (*P. simonii*), from which cross Burbank also produced Santa Rosa and other varieties as previously mentioned, but according to Wellington[2] the Apex plumcot is a typical *P. salicina.*

European or Domestica Plums.

This group of plums contains many good dessert varieties, and to it also belong all the varieties which are used for drying, *i.e.*, prunes. This is on account of their high sugar content, which allows some varieties to be readily dried in the sun without undergoing fermentation.

The varieties of prunes most widely grown in New South Wales are D'Agen and Robe de Sergeant, and although Burbank produced many new varieties of prunes, such as Standard, Sugar, Splendor, and Conquest, none of these is considered to be equal to the common varieties. In California, Standard and Sugar are grown to some extent. In his early work in prune breeding Burbank naturally used the variety D'Agen, which is still the best and the most widely grown variety in America. The D'Agen prune was introduced to America as early as 1856 by a Californian nurseryman, who brought the scions from the village of Agen, in France. It is highly esteemed as a prune because of its excellent colour and rich flavour, the fine texture of its flesh, and its comparatively small, thin, smooth pits. It is a heavy bearer, and this tendency frequently causes the fruit to be small. Although this is a defect from the marketing standpoint, larger varieties are generally of poorer quality, with a coarser and more stringy flesh, or have large pits. Burbank set himself the task of improving the D'Agen in size, while retaining its high quality. A further objective was to increase the sugar content.

Splendor.—His first new prune, Splendor, was introduced in 1893. This was the result of crossing the Hungarian variety (otherwise known as Pond's Seedling) with D'Agen. Splendor was larger in size than D'Agen, and had 5 per cent. more sugar, but never made any headway because the fruit still clung to the tree after ripening—a serious drawback in a prune.

Giant.—Giant was the next Burbank plum of this class to be introduced (1895) This variety is of similar breeding to Splendor, except that D'Agen was used as the female parent in the cross instead of the male. Although grown to some extent in America and also in New South Wales, this variety resembles its Pond parent in that the fruit has coarse, rather dry flesh, lacking the flavour, sweetness, and juiciness of D'Agen. On account of its low sugar content, Giant does not cure well as a prune, but it is a large, attractive plum which carries to market very well. It is a late plum, and differs from most other varieties in being self-fertile, not requiring pollinating varieties to be grown in its vicinity like other domestica plums and prunes, such as Robe de Sergeant, President, Grand Duke, Angelina Burdett, Pond's, Diamond, Golden Drop, and Italian.

Pearl.—The next domestica plum to be introduced by Burbank was Pearl (1898). This is a seedling of D'Agen. The skin and flesh are of pale amber —hence the name Though of excellent flavour and delicious aroma it did not cure well, and, not being a productive variety, it never made any headway. It has recently been introduced into New South Wales by the Department for use in breeding. It will only cross with varieties of the domestica group.

Sugar.—Sugar is another Burbank prune introduced by him in 1899 It is also a seedling of D'Agen, and, although not grown to any known extent in New South Wales, is cultivated to some extent in California. In this variety Burbank was successful in improving on the sugar content of D'Agen, the variety Sugar having 5 per cent. more sugar than the parent variety. It is also larger in size than D'Agen, but suffers from the same fault of being somewhat over-prolific, which decreases the size of the fruit if it is not thinned. This prolific habit, which may be due in part to its self-fertility, causes very irregular cropping. Burbank himself said of the variety that its wood is somewhat brittle, limbs breaking easily. Although having a higher sugar content than D'Agen it is much below it in quality as a prune, and is also only of moderate dessert quality. These features have prevented the variety from becoming very popular, and it is not considered that it is likely to take the place of D'Agen to any extent, although it is a fortnight or so earlier, ripening about the same period as Robe de Sergeant.

Standard.—After a lapse of many years in which Burbank bred from some of his own productions rather than from D'Agen, the Standard prune was introduced by him in 1910. This variety, which is a cross between Sugar and Tragedy, was one of only twelve or fifteen seedlings of this cross. It has large dark purple fruit, which is completely freestone in character, but only of moderate dessert and prune quality. It made a little headway as a commercial variety in America, but is now said to be rapidly waning in popularity. This variety was introduced into New South Wales by the Department of Agriculture some years ago and was found to be of very dwarf habit, which did not alter when worked on to peach, apricot and plum stocks.

Conquest.—Burbank also conceived the idea of producing a stoneless plum or prune, and used a partially stoneless plum from France with a sour acrid fruit as a parent in cross-breeding with this object. The Conquest prune was introduced by him in 1911, being a cross between the aforesaid plum and a French prune. Burbank fancifully paints the picture: "When the cultivated plum produces a useless stone, it has worked to no purpose, and the energy that goes to build the stone might far better have been utilised, even from the standpoint of the plant itself, in the production of fruit. Under conditions of artificial cultivation, the stone is not merely useless to the fruit, it is a positive encumbrance." In the Conquest prune Burbank nearly succeeded in getting rid of the stone. In boosting this variety he stated: "From 3 to 6 per cent. of the bulk of the D'Agen prune is stone. The specks of stone that remain in the Conquest do not constitute more than one-thousandth part of the fruit, which is thus edible practically without waste." But the fact is that the small portion of stone left in the Conquest prune is so objectionably sharp like a fishbone that it is more trouble than the whole stone in addition to being a danger, so that Burbank's dream or hope of its becoming popular has never materialised. This is apart from its quality being still inferior to D'Agen.

Other Domestica Plums in New South Wales.

The most popular European prunes and plums in New South Wales are, in their order of importance, D'Agen, Robe de Sergeant, President, Grand Duke, Angelina Burdett, Pond's, and Giant Of these only D'Agen and Robe de Sergeant are used as prunes.

It will be seen that, in contrast to his work with Japanese plums, Burbank has not contributed anything of much value among prunes or domestica plums for New South Wales. In America also D'Agen is by far the principal prune grown, though in some sections Imperial D'Epineuse and Italian are grown to some extent, but of the Burbank varieties the only ones which are grown at all are Sugar and Standard, and these only in a small way. Giant is grown to a fair extent as a shipping plum in California, but among domestica plums, Diamond and Grand Duke are grown more extensively for this purpose. Even in America, therefore, Burbank did not have much success in his attempts to evolve superior varieties of domestica plums or prunes.

Burbank will always be remembered in America, Australia and other countries for his contribution to the class of Japanese plums or Japanese hybrid plums. These were not obtained, it is true, by any highly developed art of which Burbank was alone the master, but in the first place by a very creditable interest in plant introduction, which must always be the foundation of any successful breeding work, and, secondly, by experimental cross-breeding between species and varieties, which, while it did not add greatly to the knowledge of fruit breeding for future workers, nevertheless did achieve some very useful practical results.

It is really surprising how well the layman knows the name of Burbank and is ready to state that he was the world's greatest breeder, having done more valuable work than all other plant breeders in creating superior new varieties of flowers, cultivated fruits, and crops. Such is the power of advertisement. Burbank really did good work with plums, but few of his creations in other fields lived long. As expressed by Jones[3]: "Burbank's incontrollable characteristic of over-statement, his uncritical attitude towards his own work and gross exaggeration of facts, together with misstatements and the ridiculous nonsense of Harwood, Wickson and other writers about his work, have naturally led to an over-critical attitude on the part of most geneticists and horticulturists as to the real merits of a man who was sincere in his efforts, personally charming and extraordinarily industrious."

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[3] JONES, D. F.—
1928.—Burbank's Results with Plums. *Journal of Heredity*, August, 1928.

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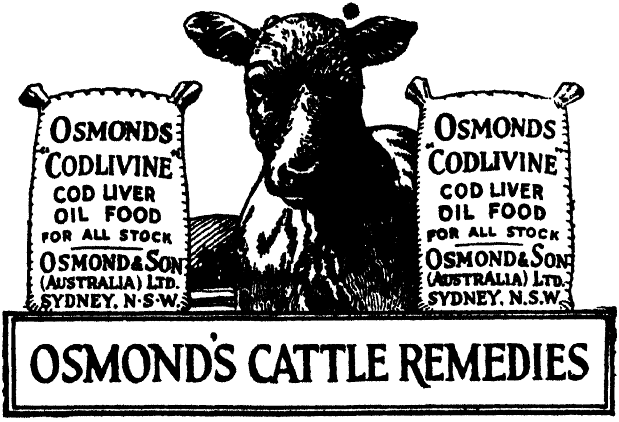
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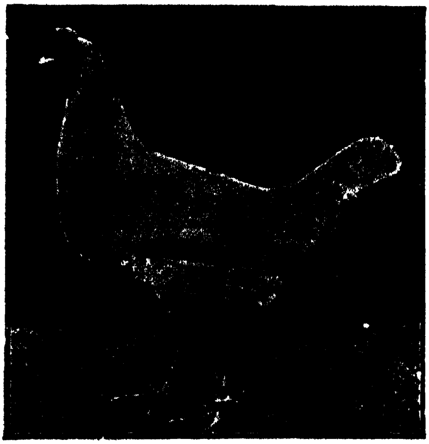

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Orchard Notes.

OCTOBER.

C. G. SAVAGE and W. LE GAY BRERETON.

THE frequent rains during the winter in many instances so delayed ploughing that it was not completed until September or early this month. In such cases, if the work has been thoroughly done, the soil will not require further attention for a little while, except some classes of heavy clays, which are liable to dry into large tenacious clods if not broken down soon after ploughing is completed. Where ploughing was done earlier the rain and tramping during spraying, &c., whilst the soil was in a wet state, will have compacted it very much. This condition will need correcting, and in many cases its correction will be beyond the ordinary cultivator, and hence will call for another ploughing. If there is no bulk of long weed growth or other trash to turn under, this ploughing could be done with the mouldboards removed.

The working of the soil at this time of the year requires greater care than in the autumn and winter so as not to disturb the small feeder roots.

Control of Codling Moth.

During this month apple and pear growers will be busy applying the arsenate of lead sprays for codling moth. Although the first or calyx spray is most important, and it is essential that this first spraying be very thoroughly done, writes Mr. G. W. Beverley, Senior Fruit Instructor, Griffith, each succeeding spray plays its part in the controlling of this serious pest and should receive the necessary attention at the regular time. It is recommended that the first two sprays consist of arsenate of lead alone at a strength not weaker than prescribed by departmental regulations, while the subsequent sprays will be increased in effectiveness by the addition of 1 gallon of miscible white oil to each 80 gallons of lead arsenate mixture, those growers who have used this mixed spray in previous years speaking well of its controlling powers. It has indeed proved more efficacious than stronger mixtures of arsenate of lead alone. The effect of the addition of the oil is that any eggs that the oil touches are destroyed, whereas the lead arsenate merely kills the live grub when it attacks the fruit.

Although bandaging the trees is not now a compulsory measure, it is strongly advocated, and any pome fruit grower who desires better protection for his crop will still be well advised to continue to bandage, though it must be borne in mind that unless the bandages are regularly inspected they will do more harm than good. From the experiments conducted by the Department it has been found that from 40 to 75 per cent. of the grubs which escape destruction by spraying reach the bandages, and if careful and regular inspection is carried out, the bulk of these can be destroyed. Growers are therefore strongly advised, in their own interests, to continue the use of bandages.

What the Regulations Require.

The codling moth regulations require growers to—

1. Thoroughly spray all apple, pear, and quince trees and suckers four times every year with arsenate of lead in the proportion of not less than 24 oz. of dry arsenate of lead powder or 48 oz. of arsenate of lead paste to 50 gallons of water, at the following times, viz., the first spraying to be commenced when the majority of the petals have fallen and to be completed by the 30th October, the second spraying to be commenced three weeks from the commencement of the first spraying and to be completed by the 20th November, the third spraying to be commenced three weeks from the commencement of the second spraying and to be completed by the 11th December, and the fourth spraying to be commenced four weeks from the commencement of the third spraying and to be completed by the 8th January.

2. Keep all apple, pear, and quince trees free from loose bark and broken limbs, and keep all crevices or cavities in such trees free from the larvae and pupae of *Cydia pomonella* (codling moth), and destroy by burning all such larvae, pupae, and litter arising from the removal of the loose bark and broken limbs and from the cleaning of the crevices and cavities.

3. Collect and remove from the orchard all fallen apples, pears, and quinces at intervals not exceeding seven days.

4. Destroy all infected apples, pears, and quinces at intervals not exceeding seven days by boiling for ten minutes, or by burning or by placing in a pit suitably covered.

Advantages of Orchard Sanitation.

Growers may be reminded of the danger of leaving loose or rough bark on tree trunks or limbs, or unfilled crevices in the trunks or limbs, which provide shelter for codling grubs. On young smooth-limbed trees this danger is limited, but in older trees care should be taken to remove loose bark and plug up crevices with grafting wax or other suitable substance, thus reducing the shelter for grubs, which will emerge later as moths and cause reinfestation of the fruit.

Destruction of infested or fallen fruit is again advocated as leading to the destruction of many grubs during the season, and preventing late season reinfestation. For the easy, safe, and effective destruction of such fruit, growers are urged to adopt the use of the covered pit devised by the Entomological Branch of the Department. The pit is about 5 feet by 8 feet across and some 5 or 6 feet deep, and is covered with a lid consisting of a wooden frame standing 2 feet above the ground, covered on top and at the sides with ordinary galvanised iron sheeting. In the top is cut a small chute (either self-closing or with a tightly-fitting lid) through which the waste fruit is thrown. Such a pit, tightly covered, as described, is a ready means of disposing of waste and infested fruit, and obviates the need for boiling or burning such fruit, which is a consideration in districts where wood is not readily obtainable. The codling moths and grubs cannot escape, and eventually die.

Details of the pit are given in a separate departmental leaflet.

Other Spray Programmes.

Spraying will also be necessary for black spot in districts where apples and pears are liable to this disease. Most varieties will have been ready in September for the 6-4-40 application of Bordeaux mixture at spur-burst stage. As a Bordeaux mixture is liable to russet the fruit if applied at the pinking stage, lime-sulphur (1-14) is recommended for this application, and lime-sulphur (1-35) for the calyx application. An article on the control of black spot of apple appeared in the September issue of the *Gazette.* In some districts the above-mentioned and later applications of lime-sulphur will also control apple mildew, but in others and in some seasons, precipitated sulphurs such as atomised, dritomic or colloidal give better control.

Control of black and green peach aphis and black cherry aphis was dealt with in the July issue of the *Gazette.*

A watch should be kept for the apple leaf jassid. This pest weakens the trees very much by sapping the foliage, and the excreta from the insects badly soils the fruit, making it very unsightly. An application of nicotine sulphate (40 per cent.), 1 pint to 75 gallons of water plus 1¼ lb. soap should be made before the first brood reaches the adult stage, and a second application three or four weeks later, special care being taken that the spray reaches the under side of the leaves.

If the weather is favourable for the development of disease, grape vines should be sprayed with 6-4-40 Bordeaux mixture, when the buds are bursting, and later with 6-4-50 strength.

Leaflets on the control of codling moth, apple leaf jassid, black peach aphis, green peach aphis, black cherry aphis, black spot of apple and pear, powdery mildew of apples and black spot and downy mildew of grapes are obtainable free from the Department.

Disbudding.

Trees that have been previously worked over by budding or grafting should be examined periodically, and any shoots coming from the original variety should be checked to prevent them from sapping the grafts or buds. Though it is necessary to check the shoots from the original variety, it is better not to brush them out altogether, as they provide shade and also foliage to assist in elaborating the sap. A leaflet on the after-care of buds and grafts is obtainable free from the Department.

Cherry Pollination.

For some years past departmental fruit inspectors in the two principal cherry districts of this State have made observations on the fruit setting of the main varieties of cherries. From the result of these observations Mr. D. D. Atkins, at Orange, concluded that the irregularity in cropping of St. Margaret cherry was in many instances due to lack of effective pollination. He found that the pollen of Bigarreau Napoleon would fertilise St. Margaret, also that Florence to some extent would fertilise St. Margaret, but was not so effective as Napoleon.

In the Young district Mr. S. A. Thornell arrived at the same conclusion in respect to St. Margaret. He found that Noble also was fertilised satisfactorily by Bigarreau Napoleon, and to a lesser extent by Florence, and that Early Purple Guigne fertilised Early Lyons, and that interpollination was reciprocal between these two varieties.

The above conclusions could only be arrived at by observations made from season to season, and it is very gratifying to find that results obtained from exact trials carried out by the Director of Plant Breeding of this Department support these conclusions, as can be seen from the following:—

From investigations carried out by Mr. Macindoe, Plant Breeder, and Mr. Walker, Orchardist, New England Experiment Farm at Glen Innes, it was found that St Margaret was self-sterile and was fertilised best by pollen from Bigarreau Napoleon, Early Purple Guigne, Eagles Seedling and Precoce de Boppard. It gave a poor setting with Early Lyons and Florence, and appeared to be completely intersterile with Noble. Early Lyons was found to be self-sterile, and was well fertilised by pollen from Early Purple Guigne, Bigarreau Napoleon and Eagles Seedling. Early Lyons was not well fertilised by St. Margaret. Noble was self-sterile, but was very fruitful with Bigarreau Napoleon, Early Purple Guigne, Eagles Seedling, and Precoce de Boppard. It set only fairly with Florence, and appeared to be intersterile with Early Lyons and St. Margaret. Bigarreau Napoleon was reciprocally good with St. Margaret, Early Lyons, and Noble.

It is admitted that it can be argued that large, solid blocks of St. Margaret and Early Lyons cherry trees exist that have apparently cropped satisfactorily without any reasonable opportunity for cross-pollination. If a close record were kept of the cropping of these blocks, it is probable that their cropping is not so regular as is assumed. That they undoubtedly have yielded heavy crops in some seasons does not at all weaken the evidences that these varieties are generally self-sterile or almost so. It is a recognised fact that a variety may be self-sterile in one district and fertile in another, but more than that—a self-sterile variety of fruit in some seasons may be fertilised by its own pollen. It has been observed in the field that it is in the seasons of poor setting that the benefits of cross-pollination are most evident, and it is in such seasons that the crop is most valuable.

At any rate, cherry growers who are not satisfied with the cropping of their trees when other conditions are favourable for the setting of fruit should examine the relative positions of their different varieties, and if the provision for cross-pollination is inadequate the position should be corrected by working over sufficient trees with interfertile varieties. As the working over of established trees is something of an undertaking, it is advisable to reduce the number of pollenisers to the effective minimum. This can be done by working every third tree in every third row. If this order is started at the second tree in the second row of the block, this plan will allow one polleniser in direct proximity to every eight trees.

If new plantings were being made it would be preferable to plant every third row, starting at the second row if the polleniser to be used is a marketable variety; if not, then the plan just described should be adhered to. When selecting pollenisers from those mentioned above, period of blossoming and commercial value of the fruit of the polleniser must be considered. Early Purple Guigne commences to blossom a little before but overlaps with Early Lyons. Eagles Seedling also overlaps with Early Lyons. Thus there is a choice of two pollenisers for Early Lyons.. There is a decided advantage in having two pollenisers for a variety, as in some seasons one of them may not blossom freely, or even if they both blossom freely their relative effectiveness as pollenisers may vary from year to year.

In early cherry districts a limited number of Early Purple Guigne trees are not out of place (these, of course, should be on either Kentish or Mahaleb stock, and worked as close to the root as possible), and both this variety and Eagles Seedling could be used as pollenisers for Early Lyons. In the late cherry districts, however, Early Purple Guigne is of very little commercial value, and Eagles Seedling should be relied upon as a polleniser for Early Lyons. Though the Plant Breeder's investigations showed that Early Purple Guigne and Eagles Seedling will fertilise St. Margaret and Noble, they blossom too early to be relied upon in orchard practice. Bigarreau Napoleon commences to blossom before St Margaret and Noble, but overlaps with these varieties. Bigarreau Napoleon, though at one time grown commercially, later got into disfavour on the market, but fortunately is again sought after by the canners, so at present it appears to be the best choice as a polleniser for St. Margaret and Noble.

Mr. Thornell is of the opinion that Late Mottled Bigarreau is a more effective polleniser for St. Margaret and Noble than Bigarreau Napoleon at Young. Unfortunately, however, Late Mottled Bigarreau is of very little market value, being a poor carrier.

Growers who wish to test out the value of cross-pollination before working pollenisers into their blocks of cherries could do so by suspending sprays of blossoms of approved pollenisers in cherry trees of bearing age that have failed to crop satisfactorily, though blossoming profusely. Sprays should be selected that are just commencing to come out, so that blossoms will continue to come out over a week or more. The cut end of the small limbs or sprays should be placed in a can of water, and the cans examined every day or so and the water replenished. Trees should be chosen that are not in the proximity of another variety that might pollenise them.

It should be remembered that lack of effective pollination is not the only cause of failure of satisfactory setting of fruit, and though evidence indicates that cross-pollination does assist the blossom to resist to some extent adverse conditions, these conditions may be sufficiently extreme in some seasons to blot out any advantage from foreign pollen, and, as has already been pointed out, in some seasons varieties that are usually self-sterile may set a crop from their own pollen.

It might be mentioned that plant physiologists in England, Canada, and the United States have found that most of the sweet cherries are self-sterile.

Budding and Grafting of Citrus Trees.

The spring budding and grafting of citrus trees may now be performed, and if satisfactory buds can be obtained they will often "take" better than dormant ones. One of the difficulties is to obtain buds in the spring that have not already "shot," and grafting is often used. The tree must be cut off cleanly to the limbs which it is desired to insert the grafts into, and a very sharp knife used to pare the scions down to the required thickness. The bark is slightly opened and the slips of grafting wood inserted and tightly bound round with waxed cloth The top of the cut limb should be covered with a preparation of grafting wax made up of 3 lb. resin (powdered finely), 2 lb. beeswax, 1 lb. mutton tallow. Melt all together and keep warm when applying to the wound.

In cases where spring and summer budding are practised, the tops of the stocks may be removed to within 6 inches of the bud as soon as the buds are well set, or about three weeks after their insertion Where buds were inserted last autumn the stocks can be cut back close above the bud. As the shoots develop they should be occasionally pinched back or tied to a stake or stub of limb to prevent them being blown off.

Planting of Citrus Trees.

With the present weather conditions following a wet winter, citrus trees can still be planted with safety; very good results have followed plantings of citrus during October in some favourable years. Although very late frosts have been known to occur in this month, it is generally considered safe in this respect, and with moist soil conditions and warm weather the trees often make a quicker start than if planted in September.

Thinning of Apricots.

In view of the heavy showing of fruit spurs on apricot trees this season it is likely that there will be a very heavy setting, and if the trees escape a late frost, such as they encountered during the blossoming stage last year, the crop will certainly need thinning. To get the best result, this should be done before the stone hardens, the fruit being spaced to about 2 inches apart on the spurs. Judicious thinning of the fruit will improve the quality to a very great extent, and if the trees have been well cultivated and manured the result should be fruit of exceptional quality. It pays to grow only the best in these times of competition, and every attention should be given in order to produce the highest grade fruit both for marketing fresh and drying.

It has been found that where large quantities of sulphate of ammonia have been applied during the winter or early spring, the fruit, although very large, is often soft and light-coloured, and if rain falls during the ripening period it will crack badly, while the drying fruit often goes black in the centre.

Irrigation should be applied sparingly before the ripening period, but cultivation should be kept going in order to conserve the moisture in the subsoil, and to keep the growth moving all the season so that no check is given to the trees whilst carrying their crop.

Control of Thrips.

The attention of growers in the later districts may be directed to a recent reminder by the Entomologist concerning control of thrips, which have been showing up in large numbers in the blossoms of stone fruits and in garden and other plants. It is pointed out that thrips may enter the bloom as soon as the blossom buds begin to unfold, and frequently damage is done before the blossoms open fully. The pest is at all times a troublesome one to control, and once the insects have entered the buds it is difficult, if not impossible, to reach them by any spray.

In previous infestations, states the Entomologist, nicotine sulphate, to which miscible white oil or soap has been added, has given the best results, but one or even two applications applied before the buds commence to unfold may be necessary to reduce the infestation. In pome fruits, such as apples and pears, the first application should be given at spur-burst.

The spray is made by mixing nicotine sulphate (40 per cent) with water in the proportion of 1 pint to 75 gallons, and then adding three-quarters of a gallon of miscible white oil. If the nicotine and soap mixture is used, 3 lb. soap is first dissolved in the 75 gallons of water, and 1 pint of nicotine sulphate is then added to the mixture.

SOIL FERTILITY IS DETERMINED BY MANY FACTORS.

“THE soil is not an inert mass of material, out of which the plant picks whatever material is present for its nourishment, and having exhausted that, dies, but must be regarded as the medium in which the plant grows, and in which complex changes—chemical and biological—are taking place among the constituents. When we talk of changes that take place in the soil, we must realise that the changes are constantly going on, that the material of which the soil is composed is continually altering, that the growth and decay of plants, the movements of earthworms and of minute organisms, the fall of rain, the evaporation of moisture, alternations of temperature of night and day, and of summer and winter, even alterations of atmospheric pressure, the passing of clouds, and countless other phenomena of which we take no heed, or whose actions we do not yet fully understand, all these agencies produce an incessant series of changes within the soil. When we add to these the changes produced by human agencies—by cultivation, by ploughing, liming, manuring, &c.—it will be seen at once that a mere statement of the amount of fertilising material—potash, lime, phosphoric acid, and nitrogen—in the soil, even if we could say how much was actually available for any particular crop, is not all that is required to permit an evaluation of the soil's fertility.”—An extract from *The Farmers' Handbook,* obtainable from the Department of Agriculture, Box 36A, G.P.O., Sydney, price 11s. 6d. posted.

Codling Moth Experiments, 1930-31.

RESULTS OBTAINED AT BATHURST EXPERIMENT FARM.

S. L. ALLMAN, B Sc.Agr., M.S., Assistant Entomologist

DURING the past season a further series of experiments for the control of codling moth, as set down by the Entomologist, was carried out by the writer. I have to express appreciation of the facilities afforded by Mr. R. G. May, the manager, and Mr. J. A. Ballantyne, the orchardist.

As in the previous season's tests, the main object has been to obtain a spray giving a maximum control of the pest, and at the same time avoid the danger of an excessive arsenical residue on the fruit at harvest time. Except in a few isolated instances, where hand wiping of the fruit was found to be essential, it may be stated that there is no general attempt among Australian orchardists to remove this arsenical residue after harvesting. Wiping and washing machines, at present in almost universal use in the United States of America, have not yet been adopted in New South Wales, and consequently the question of keeping the residue within the limit of tolerance is of the utmost importance. Experimental washing of the fruit in dilute acid has been carried out by the orchardist at Bathurst Experiment Farm, and will be dealt with in a separate report. In addition to the above work, the comparative values of dusting and spraying have again been tested, and the results are included in this report.

Experimental Conditions.

(1) *Climatic Conditions.*—The season could be classed as normal, and without any abnormal or excessive activity on the part of the moths. Twelve hundred and eighty-six points of rain fell between the time of the calyx application in mid-October and the end of March, by which time the bulk of the harvesting was completed.

(2) *The Setting of the Fruit.*—The setting of the varieties under test was good in the case of Cleopatra, fair in Rome Beauty, and decidedly poor in Stone Pippin apples.

(3) *Windfall and infested fruit* destroyed before the end of December has not been included in the counts, which, therefore, deal mainly with the losses indicated at harvest time, and caused mostly by second and third brood larvae.

Field Experiments.

The following comprises a list of the treatments tested:—

Spraying Experiments—

1. Lead arsenate powder, 24 oz. in 50 gallons water—Four applications.
2. Lead arsenate powder, 20 oz. in 50 gallons water—Four Applications.
3. Lead arsenate powder, 24 oz. in 50 gallons water, plus casein-lime spreader 16 oz. in 80 gallons water—Four applications.

Spraying Experiments—continued—

4. Lead arsenate powder, 24 oz. in 50 gallons water, plus white oil (A), 1 part in 80 parts water—Three cover applications. Lead arsenate alone in calyx spray.
5. Lead arsenate powder, 24 oz. in 50 gallons water, plus white oil (A), 1 part in 100 parts water—Three cover applications. Lead arsenate alone in calyx spray.
6. Lead arsenate powder, 24 oz. in 50 gallons water—Six applications.
7. Lead arsenate powder, 24 oz. in 50 gallons water, plus casein-lime spreader, 16 oz. in 80 gallons water -Six applications.
8. Lead arsenate powder, 24 oz. in 50 gallons water, plus lime-sulphur, 1 part in 35 parts water, plus casein-lime spreader, 16 oz. in 80 gallons water--Six applications.
9. Lead arsenate powder, 24 oz. in 50 gallons water, plus tar distillate, 1 part in 80 parts water—Five cover applications. Lead arsenate alone in calyx spray.
10. Lead arsenate powder, 24 oz. in 50 gallons water, plus white oil (A), 1 part in 80 parts water—Five cover applications. Lead arsenate alone in calyx spray.
11. Calyx spray, lead arsenate powder, 24 oz. in 50 gallons water; white oil (A), 1 part in 50 parts water Five cover applications.
12. Calyx spray, lead arsenate powder, 24 oz. in 50 gallons water; white oil (A) 1 part in 80 parts water, plus pyrethrum derivative, 1 pint in 80 gallons water – Five cover applications.
13. Calyx spray, lead arsenate powder, 24 oz. in 50 gallons water; white oil (A), 1 part in 80 parts water, plus derris compound, 16 oz. in 25 gallons water—Five cover applications.
14. Calyx spray, lead arsenate powder, 24 oz. in 50 gallons water; white oil (A), 1 part in 80 parts water, plus nicotine sulphate, 1 part in 400 parts water--Five cover applications.
15. Calyx spray, lead arsenate powder, 24 oz. to 50 gallons water; special white oil (B), 1 part in 80 parts water— Five cover applications.
16. Calyx spray, lead arsenate powder, 24 oz. in 50 gallons water; proprietary emulsion (C), 1 part in 100 parts water—Five cover applications.
17. Calyx spray, lead arsenate powder, 24 oz. in 50 gallons water; tar distillate, 1 part in 80 parts water— Five cover applications.
18. Nicotine sulphate, 1 part in 800 parts water, plus tannic acid, 72 oz. per 100 gallons water--Six applications.

Dusting Experiment—

19. Dust containing 75 per cent. lead arsenate powder—Six applications.

Check—

20. Unsprayed and undusted.

Each treatment was carried out on two trees of Cleopatra, Rome Beauty, and Stone Pippin apples, thus including six trees per plot.

The normal spraying or dusting programme consisted of one calyx and five cover applications. Several plots received only three cover applications, following on the general calyx spray, for determination of the value of the later cover applications against the second brood larvae. Owing to the early mid-season maturity of the Cleopatra apple, the fifth cover spraying and dusting had to be abandoned, as its timing was so close to the harvesting period of this apple that its application would have served no useful purpose in control. The calyx application was carried out on 19th October, and the cover sprays were then applied at intervals of twenty-one to twenty-eight days, the final treatment being concluded on 13th February.

In spraying, a pressure approximating 200 lb. per square inch was maintained, and about three gallons of spray were applied to each tree. The dusting was performed by means of a small knapsack rotary blower, which

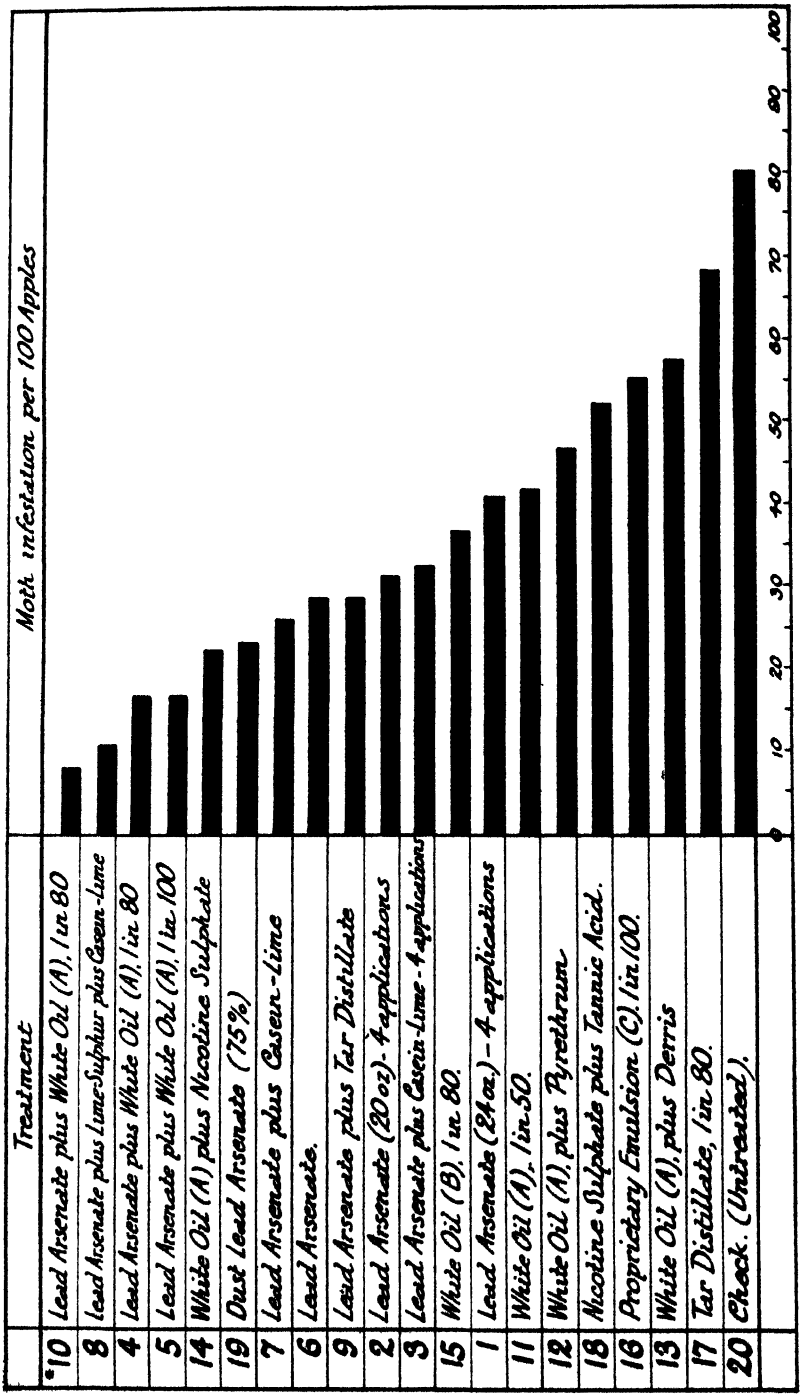

Fig. 1. Graph Showing Relative Values of Various Experimental Treatments.

* The figures in this column refer to the detailed list of treatments on pages 810 and 811.

proved to be somewhat unsatisfactory for treating the higher parts of tall trees. Each tree required about 8 oz. dust per application, which is rather higher than the amount needed when a power dusting machine is used.

Results of Spraying and Dusting Experiments.

The detailed results of the various treatments are set out in the following table, and are graphically shown in Fig. 1:—

Treatment *	Cleopatra		Rome Beauty.		Stone Pippin		Per Plot (3 varieties).	
	No. of Fruit.	Per cent. Infested Fruit.	No. of Fruit.	Per cent. Infested Fruit.	No. of Fruit.	Per cent Infested Fruit.	Total No of Fruit.	Per cent. Infested Fruit.
		per cent.		per cent.		per cent.		per cent.
1	1,338	33·56	1,029	33·62	724	60·77	3,091	39·95
2	820	31·10	1,144	29·37	91	35·16	2,055	30·32
3	2,182	30·61	583	23·67	275	56·73	3,040	31·64
4	947	7·39	641	19·19	1,105	22·62	2,693	16·45
5	1,208	7·45	961	24·25	407	25·55	2,576	16·58
6	1,840	27·39	683	28·40	2,036	27·36	4,559	27·53
7	801	32·71	1,675	17·43	1,358	30·41	3,834	25·22
8	1,059	15·68	1,629	7·98	742	17·52	3,430	12·42
9	499	25·25	865	26·13	171	42·69	1,535	27·69
10	1,306	7·81	1,503	4·26	983	11·19	3,792	7·28
11	689	40·93	324	42·90	176	33·52	1,189	40·37
12	727	34·80	170	54·12	527	57·31	1,424	45·44
13	575	44·00	439	66·06	344	65·41	1,358	56·55
14	1,049	14·11	439	30·52	771	27·63	2,259	21·91
15	1,151	38·92	1,378	25·04	342	69·59	2,871	35·91
16	1,015	50·64	291	61·86	122	63·11	1,428	53·99
17	1,149	72·24	569	71·35	65	69·23	1,783	71·85
18	1,028	45·14	974	49·18	280	79·64	2,282	51·10
19	1,162	18·24	1,686	19·93	393	47·84	3,241	22·71
20	429	78·32	296	81·42	143	74·13	868	78·69

* The figures in this column refer to the list of treatments on pages 810 and 811.

Conclusions Based on Field Results.

From the results it appears that:—

(1) Lead arsenate plus a white oil in the cover sprays gives satisfactory control of the moth. A reduction in the number of applications of white oil brings a corresponding lowering of the efficiency of the spray.

(2) The use of lime-sulphur and casein-lime with lead arsenate in five cover sprays has given good results, superior to the use of white oil with lead arsenate, where the oil has been limited to three cover sprays only.

(3) White oil, at a concentration of 1 part in 100 parts water with lead arsenate has given as satisfactory results as when used at 1 part in 80 parts water.

(4) White oil plus nicotine sulphate has given the best results of all the non-arsenicals tested, and is therefore worthy of consideration as an alternative spray where the number of applications of lead arsenate must be limited.

(5) Dusting with lead arsenate powder has achieved fair control, and in these tests has proved slightly superior to spraying with lead arsenate with and without a spreader.

(6) The addition of casein-lime spreader has given better control than the use of lead arsenate alone.

(7) The reduction in the number of applications of lead arsenate has materially increased the amount of infestation.

(8) Lead arsenate at the rate of 20 oz. in 50 gallons water has given better results than where used at 24 oz. in 50 gallons water. This is contrary to previous experience, where the higher concentrations have invariably given better control. Hitherto in testing this point the concentrations have been doubled, and it is suggested that in the present instance the difference was so small that experimental conditions have masked the result.

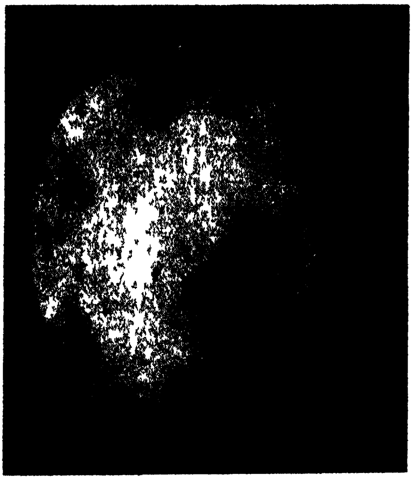

Fig. 2.—Oil-saturated Blotches Resulting from Excessive Applications of White Oil Emulsion.

Not found to occur where not more than three applications were made

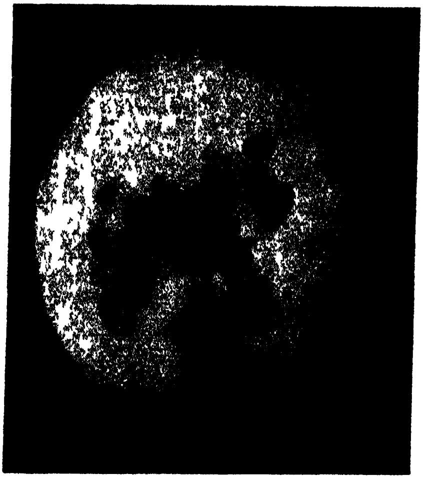

Fig. 3.—Burnt Areas about the Calyx End Caused by four Applications of White Oil Emulsion.

Three applications and less caused no burning.

(9) A specially prepared white oil (B), having incorporated with it a contact insecticide, proved superior to the use of white oil (A) to which pyrethrum and derris derivatives were added.

(10) Nicotine tannate (nicotine sulphate plus tannic acid) proved to be of little value in control.

(11) White oil (A) at 1 part in 50 parts water for five cover sprays proved to be equivalent to the use of three cover sprays of lead arsenate.

(12) A proprietary emulsion (C), also tar distillate, were proved to be unsatisfactory at the concentrations suggested.

(13) Lead arsenate forms the common basis of the most satisfactory sprays tested, and is therefore undoubtedly the most important single insecticide used in this connection.

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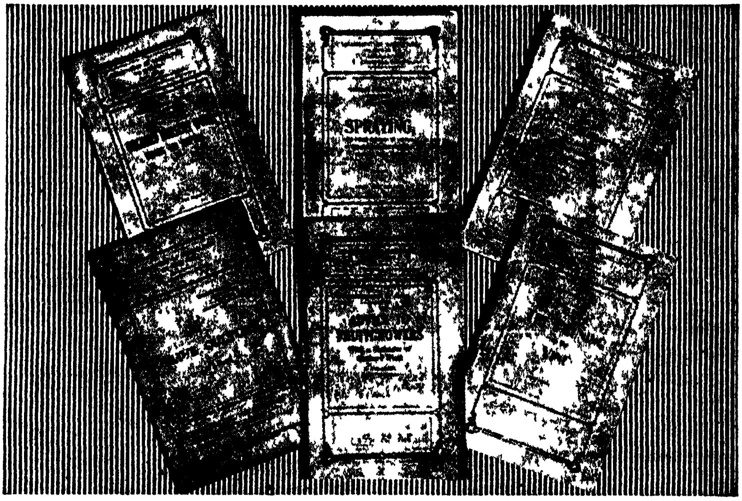

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Spray Injuries and Deposits.

During the past season excessive applications of white oil have for the first time produced slight injury to some of the fruit, and there was a tendency for fruit receiving more than three cover sprays containing oil to present an oily and dusty appearance when harvested, and the "bloom" of the apples was somewhat affected. There is evidence that Cleopatra apples were somewhat more susceptible to oil damage than Rome Beauty and Stone Pippin. The slight injury done to the fruit appears to be due to the accumulation of the oil beneath the skin of the apple. Plots receiving only three applications of white oil, however, did not suffer from this injury, which was confined to fruit sprayed with oil four or five times. Occasional blotching, due to uneven colouring of the fruit, was present (particularly in the Rome Beauty plot) where excessive spray residue occurred.

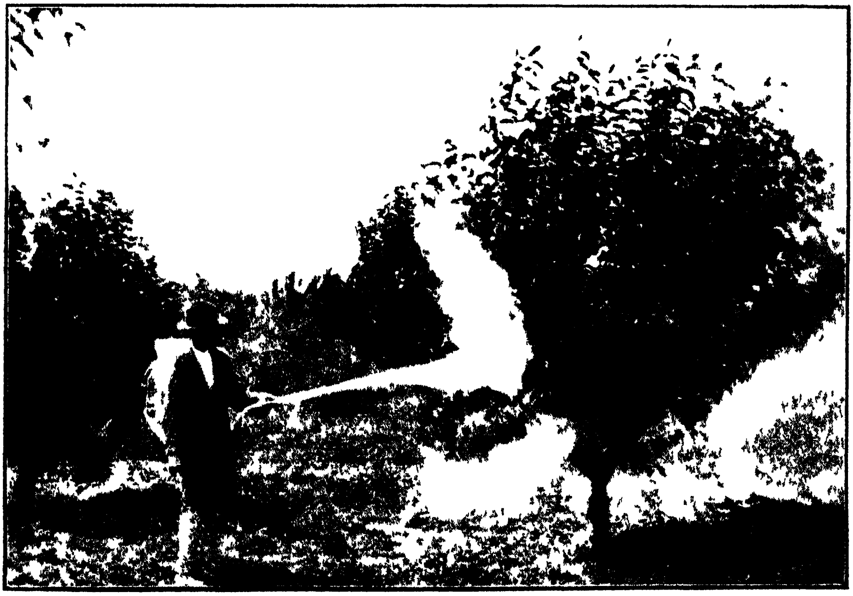


Fig. 4.—Intermittent Type of Knapsack Dusting Machine.
Only useful for small trees and in small orchards.

Of some other oil sprays tested it was found that early applications of a proprietary emulsion (C), containing a mixture of oils and other insecticides, caused a pronounced fall of immature fruit, especially from Stone Pippin.

A certain tar distillate, combined with lead arsenate, was found to be very injurious to the foliage and fruit, the three varieties of apples treated suffering equally severely. It must be remembered, however, that tar distillates have been proved highly valuable as winter sprays for the control of peach and cherry aphis.

Dusting versus Spraying.

The use of a 75 per cent. lead arsenate dust resulted in control slightly superior to lead arsenate spray alone, but not equal to lead arsenate plus white oil. To achieve this control each tree dusted received the equivalent of 6 oz. commercial lead arsenate per application as compared with 1½ oz. per tree where lead arsenate spray was used.

This extra cost in the amount of lead arsenate used per tree would perhaps be largely counterbalanced by the rapidity with which the dust may be applied.

Fig. 4 illustrates the use of an intermittent type of knapsack duster, which obviously would be satisfactory only for small trees and in small orchards; power dusting machines would be necessary for large commercial orchards.

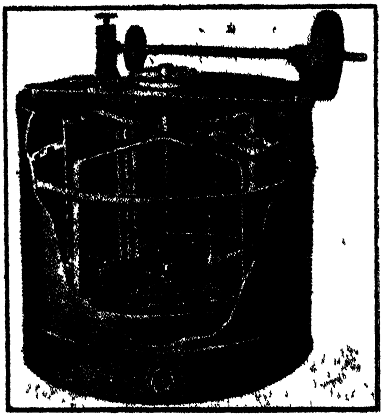
(*To be continued.*)

A RADIAL HONEY EXTRACTOR.

DURING last season, a twenty-frame radial honey extractor of local construction, the first of its kind in the State, was tested out at Wauchope Apiary. In construction it has a good deal in common with the ordinary extractor, the baskets being replaced by slotted portions. For the treatment of cappings, baskets may be placed in the radial extractor (the illustration shows one in position) and the honey extracted by centrifugal force.

Though the machine is no larger than an ordinary four-frame reversible, the honey was extracted from the twenty combs, both sides, in the one turning of the radial machine in the same time as from one side of four combs in the ordinary machine. A larger machine holding, say, up to forty frames, and operated by power, would allow of a lengthy period of extraction while the uncapping was proceeding, and of more thorough drying out of the combs than time generally permits with the ordinary plant.

The radial machine gave satisfaction with our coastal honeys, but has not been tested out with the product of the cooler inland parts where dense honey has to be contended with, although from our experience at Wauchope I see no reason why good results should not be obtained.



A Radial Honey Extractor.

The economy of space and labour afforded is a factor that demands interest in the radial extractor, which promises to be of importance to commercial men, especially where a central, power-operated plant is used.—W. A. GOODACRE, Senior Apiary Instructor.

Poultry Notes.

OCTOBER.

E. HADLINGTON, Poultry Expert.

Accommodation for Layers.

THE method of housing layers is a subject upon which there is much diversity of opinion, and one sees various types of house in use, many of which are quite satisfactory, but on the other hand, in numerous instances the class of building erected, although perhaps costly, is unsuitable, and often results in lowered production or poor health of the birds.

There are three types of house in common use for layers, viz., (*a*) the narrow "roosting only" house, (*b*) the "semi-intensive," and (*c*) the "intensive" house. Which method the poultry-farmer should adopt depends largely upon circumstances, including finance, area of land available, and climatic conditions. A description of the three systems will possibly assist those who are in doubt to arrive at a decision as to which they should adopt.

The "Roosting Only" House.

In cases where strict economy has to be observed, houses with roosting accommodation only may be erected, which can later be converted into semi-intensive by adding on to the front. The construction of this type of house is shown in Fig. 1, which illustrates a double house, but where desired a single house may be erected instead. A building of the size shown, with three perches running the full length, will accommodate 150 adult birds in each half. A large run is necessary with this system, and for each 150 birds an area of 150 feet long by at least 90 feet wide should be provided. For smaller houses the area may be reduced proportionately, but approximately 90 square feet of land should be allowed per bird. The house should face the north, and have the runs on the northern side, so that the birds have the shelter of the house from cold winds.

It will be seen that the back of the house is 6 feet high to the top of the top plate. This is essential if it is desired at any time to convert into the semi-intensive or, for that matter, intensive system, but in either case it is desirable to allow an additional aperture along the back of the house at the top for ventilation.

The following table gives the dimensions of houses required to accommodate various numbers of birds from ten to 200:—

DIMENSIONS of Roosting Houses for given numbers of Birds.

No. of Hens.	Length.	Width.	Height at Front.	Height at Back.	No of Perches.
	ft.	ft.	ft.	ft.	
10 to 15	6	6	6	5	2
20	7	6	6	5	2
30	10	6	6	5	2
50	15	6	7	6	2
100	20	7½	7	6	3
150	30	7½	7	6	3
200	30	9	7	6	4

The following table gives the materials required for a double house as illustrated:—

MATERIALS for Double House for Layers.

(This house is 60 feet long and is divided into two portions each 30 feet long. Roosting accommodation only is provided.)

Dimensions :—

Length	60 feet.
Width	7 feet 6 inches.
Height (back)	6 feet.
Height (front)	7 feet.

3″ x 2″ H.W. 6/20′, for bottom plates (length).
3″ x 2″ H.W. 1/15′, for bottom plates (ends).
3″ x 2″ Oregon 6/20′, for top plates (length).
3″ x 2″ Oregon 10/16′, for rafters and end plates.
3″ x 2″ Oregon 6/14′, for studs (front).
3″ x 2″ Oregon 3/18′, for studs (back).
3″ x 1″ Oregon 10/15′, for centre rails (back, front and ends).
3″ x 1″ Oregon 2/20′, for wire-netting doors.
6″ x 1″ T. & G. Oregon 6/12′, for ledge door.
3″ x 2″ H.W. 12/15′, for three lines of perches.
3″ x 1″ H.W. 2/14′, supports for perches.
230/6′ sawn hardwood palings for back.
90/7′ sawn hardwood palings for ends and division.
4 pairs 12″ japanned " T " hinges.
14 ft. 24″ x 1″ x 19 gauge wire netting to cover door frames.
56 ft. 48″ x 2″ x 18 gauge wire netting for front of house.
32 sheets galvanised corrugated iron.
12 lengths of guttering, quarter round.
20 guttering brackets to suit, quarter round.
1 length 3″ downpipe.
2 lb. 1¼″ x 14 diamond-headed nails.
5 lb. 2½″ x 11 diamond-headed nails.
20 lb. 2″ x 11 diamond-headed nails.
5 lb. lead washers.
5 lb. 1¾″ screws, galvanised.

The house should have a concrete floor about 1½ inches thick, and care should be taken to raise the floor at least a few inches above the ground to prevent water entering the house during heavy rains. Where filling has to be done, the earth, stones, ashes, &c., used should be well rammed before laying the concrete. A foundation of cinders and ashes well watered and rammed is probably the most satisfactory to lay the concrete upon.

Semi-intensive Houses.

The semi-intensive system is ideal for our conditions, as it enables the birds to be kept in during cold mornings or inclement weather, and given a good run at other times. The idea is to have the house sufficiently wide to permit of perching space in the back portion and a scratching area in the front half. The minimum width which is advisable is 14 feet, and the length should be at least a few feet greater than the width, but should not exceed 30 feet for a single house. There is no objection, however, to building a double house, with a solid division in the centre, where conditions permit. The width could with advantage be increased up to between 16 feet for houses 30 feet long.

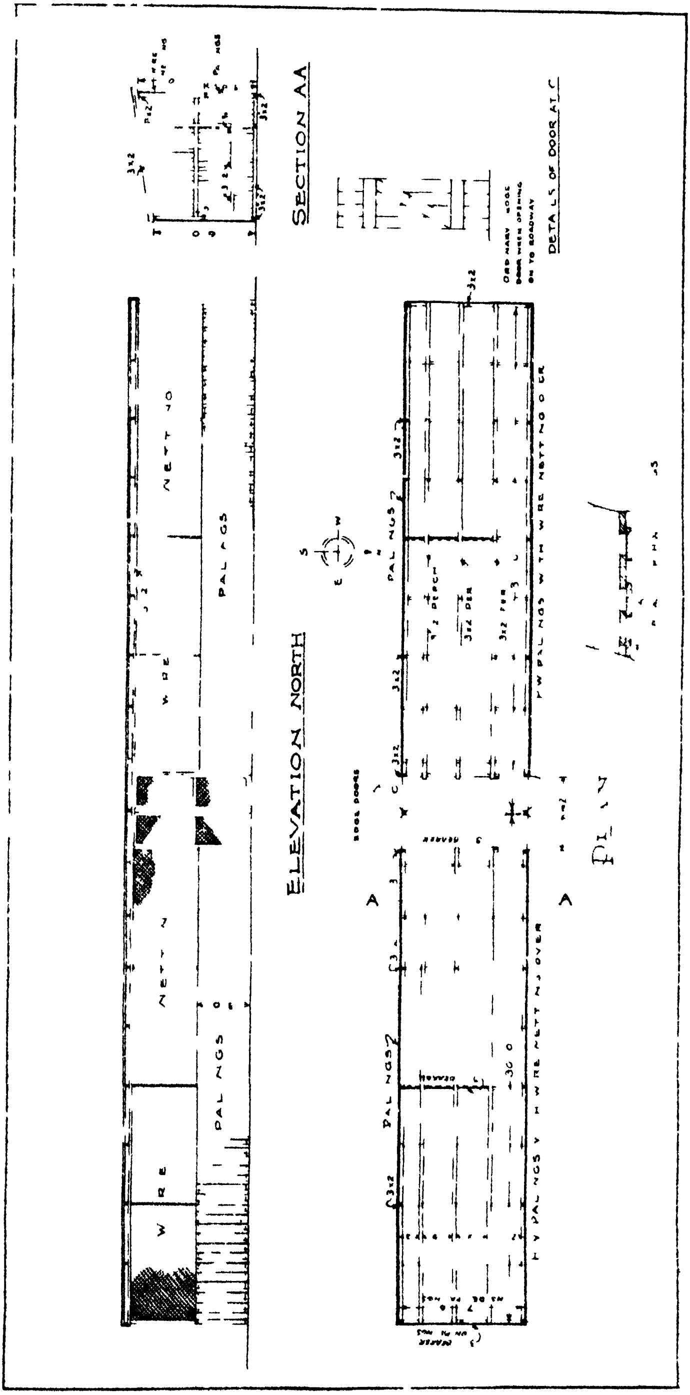


Fig. 1.—House for Layers, with Roosting Accommodation Only.

Figs. 2A, 2B, and 2C show the type of house described, and a building of the dimensions given will accommodate 150 layers. A run for a house of this size should be approximately 70 feet x 130 feet, which allows 60 square feet of run to each bird. The width and length, of course, can be varied to suit the particular site, but it is not advisable to have the run less than 50 feet wide.

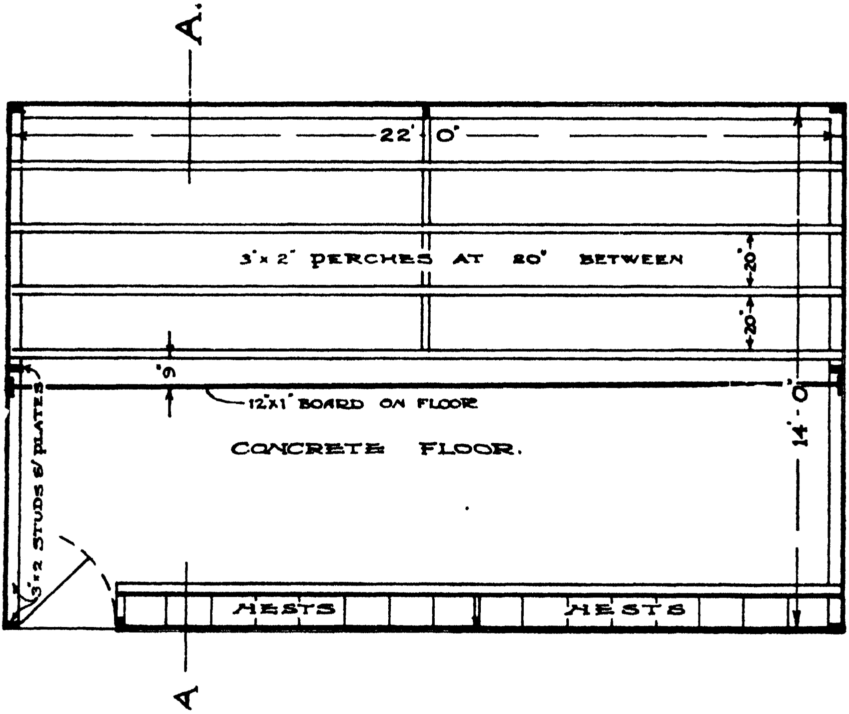


Fig. 2A.—Ground Plan of Single Semi-intensive Poultry House.

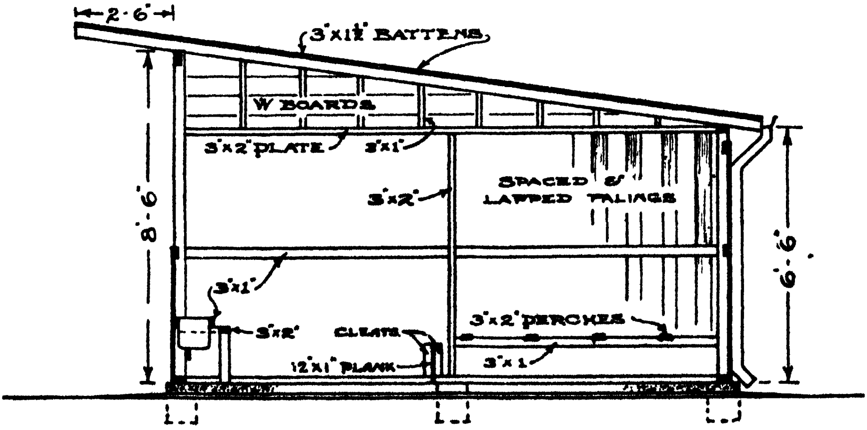


Fig. 2B.—Section AA of Single Semi-intensive Poultry House.

As in the case of the roosting house, the building should face north and have the runs on the front side for protection against cold winds.

The following table gives the materials required for the semi-intensive house illustrated:—

MATERIALS for Semi-intensive House.

Dimensions:—

Length	22 feet.
Width	14 feet.
Height (front)	8 feet 6 inches.
Height (back)	6 feet 6 inches.

3" x 2" H.W. 2/23', 2/14', for bottom plates.
3" x 2" H.W. 4/22', for roosts.
3" x 2" Oregon 2/23', 2/14', for top and end plates.
3" x 2" Oregon 3/13', 2/17', for end, back and front studs.
4" x 2" Oregon 6/18', for rafters.
3" x 1" Oregon 7/23', for roof battens.
3" x 1" Oregon 2/14', 4/20', 2/22', for end and back rails, and nest supports.
3" x 1" Oregon 3/22', for roost supports and nailing W.B. to, &c.
12" x 1" Oregon 1/22', for dividing scratching material.
Baltic weatherboards 5/14', for filling over palings at ends.
H.W. sawn palings 6' (88), for back.
H.W. sawn palings 7' (160), for ends and cut for front.
3"x1" Oregon 1/13', 1/7' 6", for wire door 6' 6"x 2' 6" covered with 1" mesh netting.
6" x 1" T. & G. Oregon 4/14', for lodge door.
Corrugated iron, 26 gauge, 24/9', for roof.
4" qr. round guttering, 4 lengths } for guttering.
½ doz. brackets to suit ... ... }
1 length 2½" downpipe ... ... }
Galvanised screws 7 lb. (1¾") ... } for roof
Lead washers, 7 lb. ... ... }
D.H. nails 1¾" x 11G. (7 lb.) ... } for general use.
D.H. nails 2½" x 11G. (7 lb.) ... }
D.H. nails 1" x 16G. (1 lb.) for nailing netting.
" T " hinges, 2 prs. 14", for door.
Wire netting 22' x 48" x 1" x 18 gauge, for front of house.
Cement, 5 bags, for floor.
Ashes, 1 ton, for concrete and filling.
1 water trough 22" long, 12" wide, 8" deep made of 26 gauge galv. iron, wired on the edges.
1 Ball cock ½", for water trough.
1 H.P. cock, ½", for water trough to cut off supply.

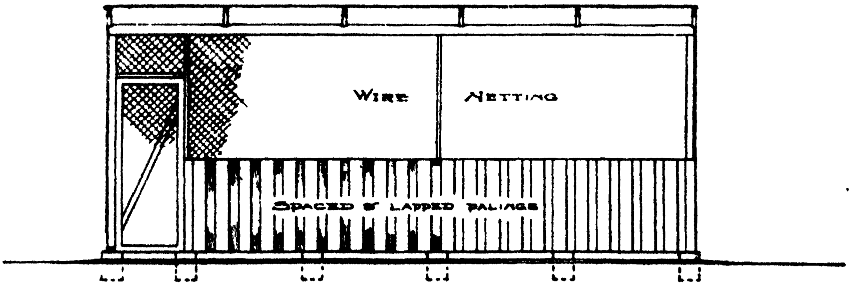


Fig. 2C.—Front Elevation of Single Semi-intensive Poultry House.

It is important that these houses have a concrete floor which should be level, otherwise the scratching litter will drift to the lowest point, leaving part of the floor bare. A 12-inch x 1-inch board running the full length of the house divides the scratching litter from the roosting portion, and at all times several inches of scratching litter, such as straw, dry grass, or other material which is not dusty should be kept in the house. The evening feed of grain is given in the litter, and the birds thus kept busy.

The dimensions of the houses required for given numbers of birds are shown hereunder:—

DIMENSIONS of Semi-intensive Houses for given numbers of Birds.

No. of Hens.	Length.	Width.	Height at Front.	Height at Back.	No. of Perches.
	ft.	ft.	ft. in.	ft. in.	
100	22	14	8 6	6 6	3
150	22	15	8 6	6 6	4
200	30	16	8 6	6 6	4

Where it is desired to run flocks of less than 100 hens under the semi-intensive system, it is best to build a roosting type of house, making it twice the length shown for that class, and to use one end for scratching litter. In such cases it is a good plan to allow the roof to overhang in front to shed driving rain.

Common Errors in Construction of Semi-intensive Houses.

An error which is commonly made in the construction of semi-intensive houses is to make the house too narrow, thus not leaving sufficient space for a scratching section, or necessitating the perches being placed too close together. For this reason a house less than 14 feet wide should not be entertained.

Frequently houses of the semi-intensive type are observed which are not being used with scratching litter, and in such cases there is very little advantage as compared with the roosting type of house. Again in other cases the birds are allowed to run out in all weathers and are not shut in at night, and thus the benefit of the system is not obtained. To secure the full advantage of the semi-intensive methods the birds should be shut in at night and be kept in until the weather is favourable. This means that during the winter time and on cold, cloudy days they should be kept in, and also during very windy weather. The adoption of these methods will result in better egg production.

Another common fault is not allowing sufficient ventilation at the back of the house. At least 4 inches, in addition to the space allowed by the rafters, should be provided underneath the top plate of the house, but the wider the house the larger the aperture required; if necessary, part of the space may be enclosed in the winter time.

The distance apart of the perches is a very important consideration; a space of at least 20 inches should be allowed between them, but where possible 24 inches is preferable. The perches should be 20 to 24 inches from the floor.

One of the most objectionable features often seen in the semi-intensive system is a long shed divided into a number of compartments, with narrow runs attached. This results in birds congregating immediately in front of the house, and the ground soon becomes foul, while in wet weather the yard becomes very muddy; if a wide run is allowed this will not occur. It is undesirable to erect more than two houses together; the runs can then be extended beyond the end of the house to allow of the desired width.

Intensive Housing.

With our climatic conditions and where large areas of land are available there is nothing to recommend the general adoption of the intensive method of housing layers. Under this system the birds are kept confined in the houses all the time, and on this account the size of the houses has to be about double that required for the semi-intensive principle. As a consequence the system is much more costly to instal, while, generally speaking, the birds kept in intensive houses for long periods are not as robust in health as those which are allowed to run out.

The only conditions which justify the adoption of the intensive system are where the area of land available is limited and it is not possible to provide the necessary runs. On no account should birds intended for breeding purposes be kept in close confinement, as this would soon lead to degeneration. Those who desire to try this method of housing would be well advised to build the houses in positions where runs can be erected for converting them into the semi-intensive system later if desired.

Materials for Constructing Poultry Houses.

Having regard to coolness in the summer time and warmth in the winter, there is nothing better than hardwood palings for the walls of the various buildings described, and iron for the roofs. Palings require very little studding, whereas if weatherboard or fibro, &c., is used, a well-supported frame is essential.

If corrugated iron is used because it is easier to erect, a somewhat larger aperture should be allowed along the back of the houses for extra ventilation in the summer, and it is advisable to have an adjustable flap over the aperture to close in the winter.

GREEN FOOD ABSOLUTELY ESSENTIAL FOR POULTRY.

THAT fowls fed on a diet deficient in green food would be stunted in growth suffer from "leg weakness," be poorly feathered and produce few eggs, is to be expected; but work carried out at Glenfield Veterinary Research Station has confirmed observations previously made there and in other parts of the world that a definite disease follows the continued absence of green food in the diet.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—	
Fitzroy	Manager, Experiment Farm, Grafton.
Large Goldmine	P. Short and Sons, "Moore Park," Armidale.
Murrumbidgee White	M. Leitch, Bulgary Private Bag, Wagga.
Sorghum—	
Sumac	Principal, Hawkesbury Agricultural College, Richmond.
Tomatoes—	
Bonny Best	Manager, Experiment Farm, Bathurst.
Marglobe	Manager, Experiment Farm, Bathurst.
Sweet Potatoes (cuttings only)—	
Vineless	S. Redgrove, Sandhills, Branxton.
Nancy Hall	
Yellow Strassburg	
Porto Rico	
Brooks' Seedling No. 3	
Director	
Pierson	
Sudan Grass	Manager, Experiment Farm, Bathurst. Manager, Experiment Farm, Nyngan.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

KEEP IN TOUCH WITH YOUR DISTRICT FARM.

THE results of trials carried out at departmental experiment farms eventually influence the methods of even the least enterprising primary producer, but the farmer who obtains the best returns is the one who is most alert to the advances in farming practice. Such farmers should make a point occasionally of looking up the manager of the experiment farm nearest to them, and keeping in touch with what is being done in relation to local farming problems. "Farmers' Days" are now a regular feature and attract large attendances, but the visits of small parties and of individual farmers are welcomed at any time.

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1st *November*, 1931.

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VOL. XLII. PART 11. NOVEMBER 1, 1931.

Agricultural Gazette of New South Wales.

The Control of Soil Erosion on Wheat Lands.

E. S. CLAYTON, H.D.A., Senior Experimentalist.

SOIL erosion is a cause of grave concern to farmers in many parts of Australia, and is already a serious problem on undulating land. The fertility of many of our soils is being gradually depleted by the slow removal of plant food as the result of cropping, but many soils are also being damaged much more rapidly by the washing away of the surface soil by rain water. It has been stated that in many instances twenty-one times as much plant food is washed away from cultivated land by rain water as is removed by cropping.

This serious damage has been allowed to proceed unchecked and often unnoticed until in many cases the land has been robbed of its original fertility; sheet erosion has often taken off the valuable surface layer before the damage has been noticed. Investigations have shown that the particles removed by washing are the richest constituents of the soil.

The Causes of Washing.

While land is timbered or under dense vegetation in its original state, there is very little loss by erosion. In fact, the rate of loss is generally less than that at which the soil accumulates by the weathering of rock. When land is cultivated, however, soil erosion is greatly increased, and on sloping country it quickly assumes serious proportions and is tremendously in excess of the rate of soil formation. Careless cultivation, of course, results in the greatest losses; the practice of ploughing round a paddock instead of in lands, for instance, is responsible for increased soil washing. Where washes once commence in cultivated land they generally become worse. The texture of the soil also influences the amount of erosion. Sandy soils absorb water rapidly and wash comparatively little, while clay soils absorb water slowly and are therefore very liable to surface washing and gullying. Intermediate soils, such as fine silts and loams, are also much affected by washing and gullying.

The most important cause of erosion is, of course, heavy and frequent rains, especially when the land is "clean-cultivated" during the fallowing period. The grade or slope is a most important consideration, and on steep slopes the amount of washing is greatly increased. Erosion is not even confined to the heavier rainfall areas of the wheat belt, nor of course is it peculiar to the inland areas, occuring also on coastal lands.

Virgin soil covered by a layer of humus seems capable of rapidly absorbing rain for long periods, and the water keeps working deeper into the soil, which apparently has great water-holding capacity, but during thirty or forty years of cultivation, sheet erosion gradually robs the soil of the humus-laden protective surface layer, and once this is removed, gulleying begins. When this stage is reached soil erosion becomes very rapid, and if unchecked, will permanently ruin the land.

Damage Done in New South Wales.

Sheet washing is serious on much of the wheat country of this State, and severe gullying even is already apparent in many districts. At the present time on the fertile country of the South-western Slopes, deep gullies are to be seen that have been cut by water in the last two years. Land that ten years ago could be cultivated and drilled across is now in many instances cut by gullies 7 and 8 feet deep and 9 or 10 feet wide. The damage has to be seen to be believed. Areas of land in these districts were cut out by the heavy rains experienced this season, and some land gullied badly where no signs of gullies had appeared previously. By ploughing the smaller gullies one may camouflage their presence, but it will not check the erosion, and at the next heavy fall all the ploughed-in soil is washed away and lost, and the gullies become still deeper. The tracks made by the wheat drill often start water running down the slope; this season some tracks were eroded to a depth of 12 inches or more. Drilling across the slope, rather than down it, is therefore advisable.

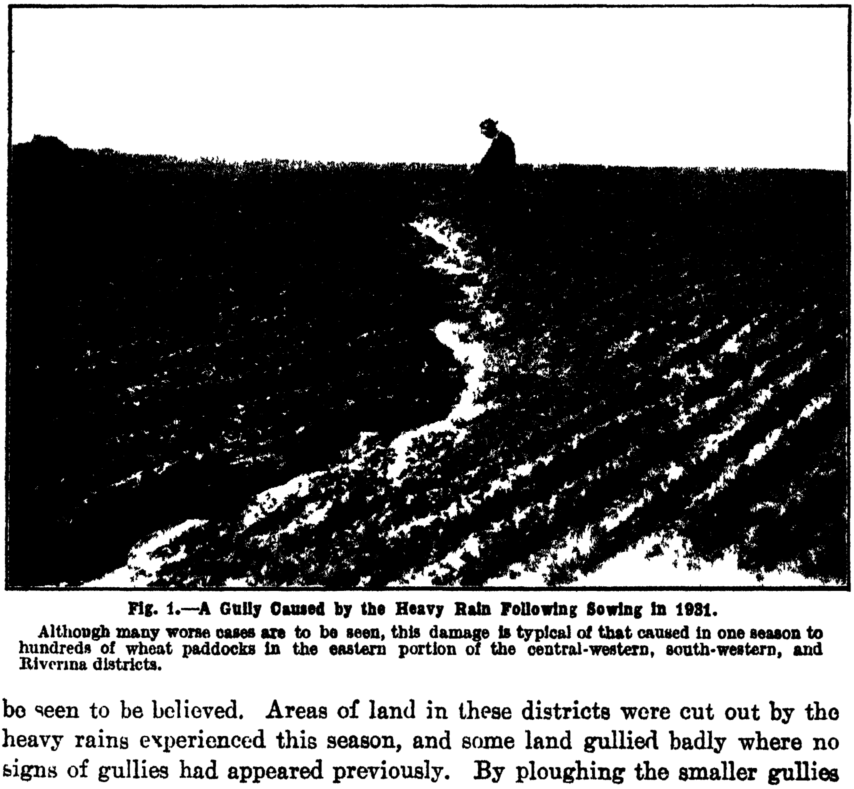

Fig. 1.—A Gully Caused by the Heavy Rain Following Sowing in 1931.

Although many worse cases are to be seen, this damage is typical of that caused in one season to hundreds of wheat paddocks in the eastern portion of the central-western, south-western, and Riverina districts.

Some of the country at present cropped in New South Wales, and which gullies so badly, is too steep for cultivation, and would be safer under pasture, especially if contour drained.

The problem is a serious one, and there is very urgent need for action, or thousands of acres of the best wheat lands in the State will be washed and gullied into barren wastes. Fortunately, a practical scheme of control, viz., the use of broad-base contour drains, has been evolved—one that is widely adopted in the United States, and which has been tested on undulating wheat country which was gullying badly at Cowra Experiment Farm.

Many gently sloping lands do not show obvious washing, but the damage is more than sufficient to justify the cost of control. Land with a slope of from 5 to 10 feet per 100 shows most satisfactory results, but the system is applicable on slopes up to 15 feet per 100 when contour farming is practised in conjunction with contour draining. This involves ploughing, cultivating and drilling with the contours and not across them.

Fig. 2. Another Example of Gullying in a 1931 Crop.

This serious damage occurred in the four months following sowing in April.

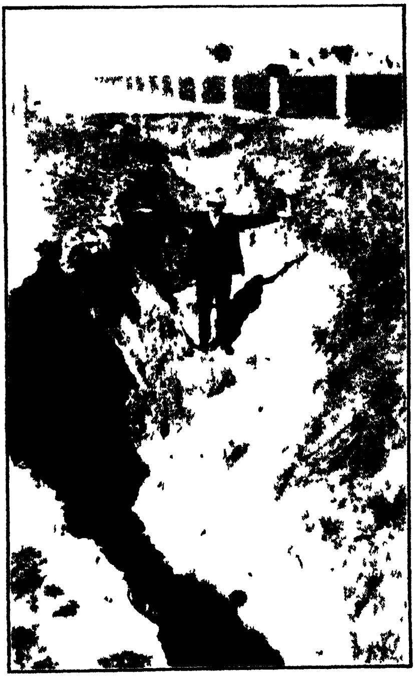

Fig. 3.—A Deep Gully cut by Water in a Cultivation Paddock.

Ten years ago there was no sign of this gully and farming implements could be driven unimpeded across the land.

Millions of acres of fertile agricultural country were definitely ruined in the United States before erosion was taken seriously in hand and checked. The ruined areas were in many instances so badly eroded that they could not be reclaimed, but steps were taken to save the remaining areas. In the State of Texas alone, in 1927, over half a million acres of agricultural land was contour terraced, and in 1928 it is estimated that another million acres was treated. An American estimate places the area of land ruined by erosion and abandoned during the last decade at 30 million acres. We in Australia should profit by American experience and not wait for a similar fate to overtake the agricultural lands of this country In the United States so much damage has been done and so much loss experienced that banks and the institutions lending money on "broad acres" are now taking steps to see that the value of the asset is not reduced or destroyed by soil erosion. In the intensive campaign to prevent soil destruction many slogans are made use of, one of the best being: "A deed to the land will not hold the soil, but a contour drain will"

Fig. 4.—Neglected Gullies Soon Ruin Good Country.

Preventive Measures.

If washing has been long continued remedies will be costly, and the land will probably never be returned to anything like its original fertility. It is therefore advisable to adopt preventive measures before serious damage is done. Many schemes were tried in the United States, but the broad base contour drain was found to give the most satisfactory results. Cover crops grown at the time of heaviest rainfall also prevent washing, and the maintenance of a satisfactory humus content by the adoption of a suitable rotation is effective in checking erosion. Deep ploughing is said to be preferable to shallow as a preventive measure. These measures are, of course, all subsidiary to some system of contour draining which will control the run-off.

Hillside ditches have been tried in many places, but they have not given satisfaction. In fact, they often cause more serious erosion, chiefly because of their bad location.

Broad Base Contour Drains.

These drains are known by various names, such as falling terraces, mangum terraces, contour drains or terraces. The falling terrace is so named from the fact that it has a definite fall or grade towards the outlet—the level terrace has no such grade, being designed to absorb all the water that falls upon it.

Wherever practicable, the terrace should consist of a broad, low ridge, so that there shall be no lost planting space, no bank to harbour weeds, and no trouble to get a team from one terrace to another.

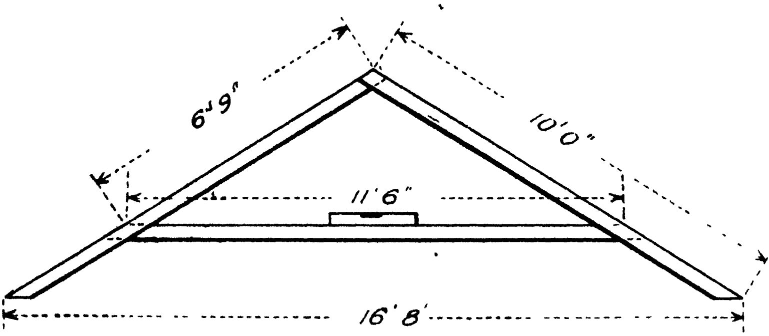

Fig. 5.—Diagram of a Home-made "Level" for use in Locating the line of the "Contour Drain."

Falling terraces are simple in construction and permanent in character, and are adapted to slopes of less than 15 feet rise to 100 feet horizontal distance. They are formed by the construction of broad, low ridges about 8 or 10 feet wide, from 1 to 2 feet high, and with a shallow drain 8 to 10 feet wide on the upper side, at a definite grade across the slope. The principle of the terrace is to conduct the water away in a shallow sheet with a low velocity, thus lessening the erosive effect and permitting most of the soil to remain. It is very important that it be built on a uniform and correct grade, and that a suitable vertical distance between terraces be maintained—in order that the water may pass off in small quantities and with a uniform low velocity.

The soils that need terracing most are the poor and worn-out ones, and the higher the state of cultivation the less the fall that need be given.

From the best available information it is believed that a fall of 1 inch per rod or 6 inches per 100 feet will give good results. The vertical distance between terraces varies from 3 to 6 feet. The correct fall and vertical distance will depend upon the slope of the surface, the character of the soil, and, to some extent, upon the length of the terrace and the height of the bank. It is best to have a short terrace, as the accumulation of water will not be so great and the danger of breaking will be lessened. Experience so far indicates that a vertical height of 4 to 5 feet between terraces on any slope within the limits of use of the terrace gives satisfactory results. This necessarily gives different horizontal distances between terraces, the greatest distance being on the least slope; hence each terrace has a different-sized watershed from which to discharge. For calculating the vertical distance to be used between terraces the following is applicable:—When the slope of the surface ranges from 3 to 6 feet in 100 feet, space the terraces 4 feet apart (vertical distance), and when the slope ranges from 6 to 15 feet, make the spacing 5 feet.

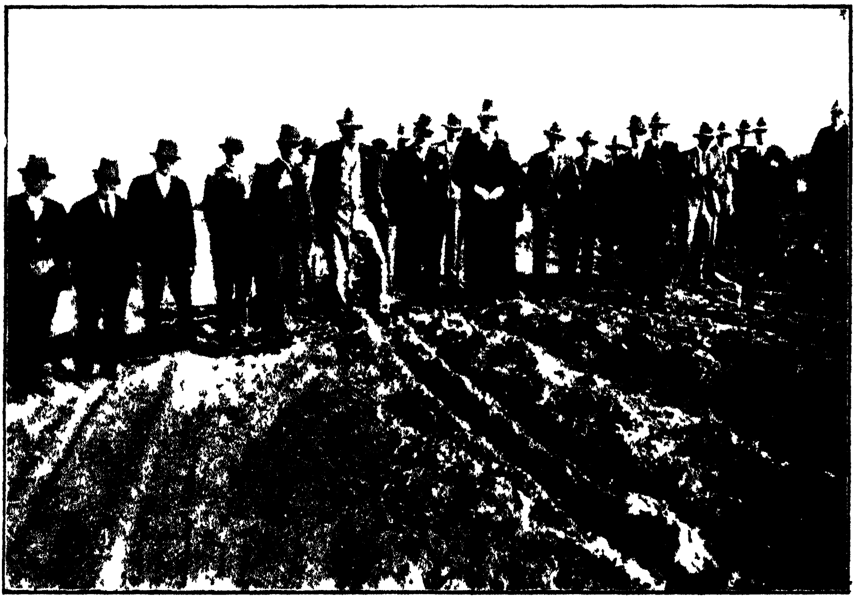

Fig. 6.—District Farmers Inspect a newly-constructed Contour Drain at Cowra Experiment Farm.
The actual "drain" is on the extreme right, the bank is in the centre, and to the left the land falls away to the natural slope of the paddock

In the drier wheat districts the drains could be level, and for most of the wheat country a fall of 6 inches in 100 feet is advisable. The banks described are effective up to about 400 yards length; if necessary to construct longer banks the height should be raised to cater for the greater volume of water.

The Location of the Drains.

The slope of undulating land is very deceiving to the eye, and it is impossible to lay out the drains satisfactorily by guesswork. A surveyor's level, dumpy level, or a home-constructed triangle should be used. The contour should not be followed when crossing small gullies or washes; the bank should run almost straight across such depressions, and extra filling will of course be necessary at such points.

When determining the location of the drain it is first necessary to decide on the best outlet for the water. If possible the outlet should be on to a permanent pasture, timbered area, or natural watercourse. If one of these is not available, a wide shallow drain should be constructed and laid down to permanent grass.

How to Make a "Level."

For pegging out the contours a home-made level can be used. This instrument will enable the line of the drain (with the required fall) to be determined. An angle is made with light, straight 4 inch by 1-inch timber, so that the base line is 16 feet 8 inches, as shown in Fig. 5. A cross batten is nailed into place at a convenient height and with the ends equidistant from the angle, and a carpenter's level is mounted thereon. One inch of timber is then cut off one leg. When both ends of this instrument are on the ground and the cross batten is level, the slope is at the rate of 6 inches in 100 feet. In working, the longer leg is always kept down the slope and the other moved up or down the slope until the carpenter's level mounted on the cross batten is level. The point is marked with a peg and the level moved ahead, placing the back leg where the front one was.

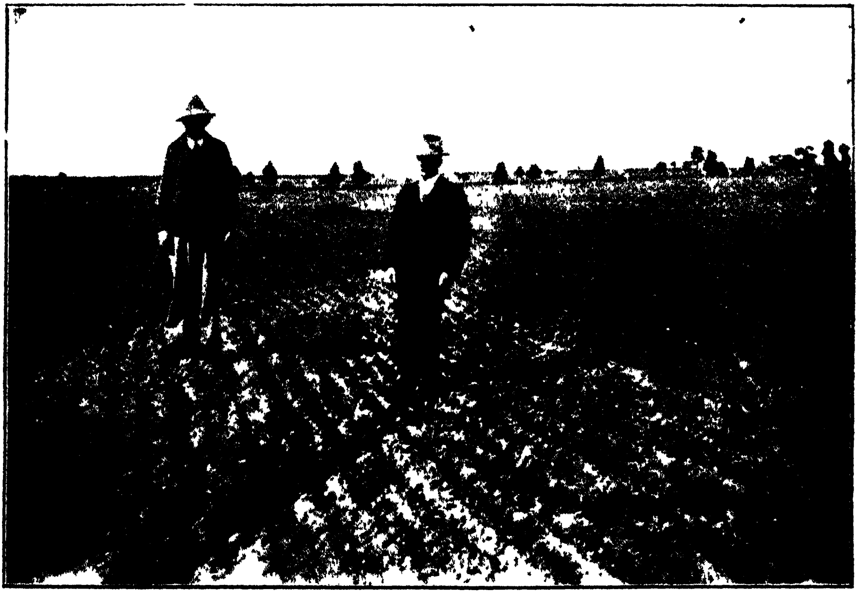

Fig. 7.—A Contour Drain Sown to Wheat.
The right hand figure is in the actual "drain," and the one to the left is on the bank

It is advisable to commence pegging out the contours at the outlet of the drain. Place the longer leg at the proposed outlet of the drain and move the other leg up or down as required. Work across the field in this way, pegging the line of the drain.

If the slope is uniform the first contour can be staked out at the top of the slope. Locate it high enough up the slope to prevent water breaking over the top of the bank. Always build the top bank first, regardless of which was staked first. If lower terraces were built first and heavy rain occurred before the top drains were constructed, they would certainly be destroyed.

Construction of the Drains and Banks.

A road grader can be used for the construction of the banks, or they may be made by repeated ploughings, backing up on the centre of the bank each time, a disc plough being better for the purpose than a mouldboard. When using the grader it is advisable, if possible, to work soil on to the bank from the upper side only Any low places which occur (such as where washes cross the line) should be built up with grader or soil scoop to prevent washing over, a little extra height at these points is worth while.

When completed, the terraces should be fairly well compacted, with no low points that would be likely to break across during the first rain. It is always desirable to check the height of each terrace with a level at questionable points to make sure that there are no low spots.

Experience with Contour Drains at Cowra.

Some of the best crops will be found growing on the top of the bank; the soil is deeper, and the close proximity of the drain ensures a better supply of stored moisture Drains constructed at Cowra Experiment Farm were most satisfactory. They could be driven over with all implements, and were cultivated and sown to wheat this season. Although in a paddock seriously eroded and from which water runs in torrents after heavy rain, the banks were so effective that no water ran out of the drain even after 1 inch of rain. Farmers in the Cowra district who saw these drains were much impressed, and the idea will be widely applied in the district this season.

Terraced Land is Easily Farmed.

Farming terraced land is not difficult, although there are some precautions that should be kept in mind. It is desirable to plough across the slope and to make the lands conform to the terraces as far as this is possible. If the land has a slope of 8 per cent. or less and the terraces are well established, they can be ignored in the whole farming scheme, but when the slope is nearer 15 per cent. the ploughing should be on the contours.

If the land has a 12 or 15 per cent. grade and a row crop is to be planted, it is best to plant the rows parallel to the terraces. There is little trouble in handling small cereals on terraced fields, except when the harvest season is wet. In this case the ground very likely will be soft just above each terrace where the silt has accumulated.

Where cultivated crops such as maize are grown, the bank must be repaired each year, and about one-fourth the original work will be required to maintain it. With wheat, etc., however, very little repair work is ever necessary.

Maize on the Far South Coast.

VARIETY AND MANURIAL TRIALS, 1930-31.

JOHN L. GREEN, H.D.A., Agricultural Instructor.

A NUMBER of farmers co-operated with the Department in conducting maize trials in this district during the past season. Although as regards total rainfall and incidence of rainfall it was far better than the season previous it is an indisputable fact that yields from these experimental areas and from farmers' sowings were 20 to 40 per cent. lower. To find the reason for this is not easy. It must be pointed out, however, that the winter of 1930 was remarkably mild, and this is not desirable for maize crops, or for that matter for any other summer-growing crops—it is to a cold, frosty winter that we look to kill off a lot of the over-wintering spores and larvae of our worst fungoid and insect pests. This did not occur during 1930, and as a result disease was prevalent in summer crops. In addition to a mild winter and absence of frosts, a summer that was little different to the previous winter was experienced. Throughout the summer months rain was recorded in the majority of centres in this district fairly consistently, and this made sufficient moisture available for growth, but maize requires more than moisture to enable it to yield heavily; hot weather is just as essential, and it was this that was lacking. It is fairly safe to say that not one hot day such as is expected in summer time was experienced, whilst the nights were remarkable for their coolness.

RAINFALL during the Fallow and Growing Periods.

	Bega	Bemboka.	Candelo.	Cobargo.	Moruya.	Pambula.	Tilba.	Towamba	Wolumla.
1930.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
June ...	324	220	309	457	624	621	514	626	604
July ...	165	80	119	95	64	439	237	361	238
August ...	35	61	21	37	35	58	85	111	35
September ..	90	50	95	39	26	85	156	154	51
October ...	413	519	548	441	442	473	524	706	508
November...	103	11	54	138	59	58	150	170	96
December ...	349	223	266	322	371	307	426	488	223
1931.									
January ...	190	113	198	157	79	107	114	192	150
February ...	146	35	103	93	95	89	169	116	137
March ...	334	213	258	195	138	427	...	441	294
April ...	260	361	199	311	442	238	...	255	237
May ...	483	365	390	540	395	456	...	400	412

On certain areas, as on hill-land, where moisture is invariably the limiting factor, the yields this season were better than those of last; maize crops for silage also yielded very well. It should not be thought that the growth of maize crops was poor; on the contrary the growth was very heavy. From a cursory glance at crops nearing maturity an estimated yield would be anything from 10 to 40 bushels heavier than the amount actually harvested.

Details of Plots.

Kiah (*R. J. Goward*).—Alluvial loam, cropped forty years to maize; mouldboard ploughed 6 inches deep 20th September, machine sown 8th October, three grains every 36 inches in rows 42 inches apart; no manure; harvested 7th May.

Towamba (*W. R. Mitchell*).—Alluvial loam, cropped fifty years to maize; mouldboard ploughed 8 inches deep 9th September, machine sown 9th October, three grains every 28 inches in rows 42 inches apart; no manure; harvested 6th May.

Pambula (*W. Cole*).—Alluvial loam, cropped fifty years to maize; mouldboard ploughed 6 inches deep 12th August, sown by hand 10th October, single grains 12 inches apart in rows 42 inches apart; 2 cwt. superphosphate per acre; harvested 11th June.

Bega (*J. Burgess*).—Alluvial loam, cropped sixty years to maize; mouldboard ploughed 9 inches deep 15th September, disced 7 inches deep 15th October, machine sown 27th October, one to two grains every 14 inches in rows 45 inches apart; 1 cwt. superphosphate per acre; harvested 29th June.

Cobargo (*D. Constable*).—Alluvial loam, cropped sixty years to maize; mouldboard ploughed 8 inches deep 1st August and 9 inches deep 1st November, machine sown 5th November, three grains 28 inches apart in rows 39 inches apart; 1½ cwt. superphosphate per acre; harvested 3rd June.

Moruya (*J. R. Milne*).—Alluvial loam, pasture 1920-30; mouldboard ploughed 6 inches deep 3rd September, machine sown 15th October, three grains every 25 inches in rows 45 inches apart; 1½ cwt. superphosphate per acre; harvested 21st May.

Bemboka (*W. C. Wilton*).—Hill granite soil, cropped one year to maize; mouldboard ploughed 6 inches deep 5th July, sown 20th October, single grains every 12 inches in rows 38 inches apart; 2 cwt. superphosphate per acre; harvested 19th June.

Candelo (*Moffitt Brothers*).—Hill granite soil, cropped one year to maize; mouldboard ploughed 8 inches deep 26th July and 7 inches deep 9th October; machine sown 21st October, three grains every 28 inches in rows 48 inches apart; 1½ cwt. superphosphate per acre; harvested 15th May.

Wolumla (*D. Atkins*).—Hill granite soil, cropped one year to maize; mouldboard ploughed 6 inches deep 14th August; machine sown 22nd October, three grains every 28 inches apart in rows 42 inches apart; 1 cwt. superphosphate per acre; harvested 24th June.

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YIELDS of Maize Variety Trials.

	Kiah (R. J. Goward.)	Towamba (W. R. Mitchell)	Pambula (W. Cole)	Bega (J. Burgess).	Cobargo (D. Constable).	Moruya (J. R. Milne).	Bemboka (W. C. Wilton).	Candelo (Moffitt Bros.).	Wolumla (D. A. Atkins).
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Funk's Yellow Dent ...	96	127	63	87	52	94	28	42	36
Leaming	110	...	72	52	68	95	37	45	52
Large Red Hogan ...	102	...	67	69	69	89	...	...	...
Boone County White	101	106	56	80	51	82	...	...	...
Hickory King ...	76	...	50	75	48	78	23	32	48
Golden Beauty ...	98	...	...	..	..	. .	25	31	30
Rumski	...	105	...	...	...	. .	...	...	...
Early Morn	...	82	...	...	...	...	...	...	...
Golden Glow	...	112	...	...	...	...	...	...	...
Golden Superb ...	...	85	...	...	...	...	26	34	...
Fitzroy	...	...	53	64	46	83	...	...	...
Kennedy	...	...	...	...	...	...	26	49	50
Large Goldmine ...	...	...	...	...	...	...	31	40	...
Iowa Silvermine ...	...	...	...	...	...	..	28	29	...
Farmer's White ...	83	...	64	...	...	...	...	...	...
James Dent	...	82	...	...	...	...	...	...	...
Murrumbidgee White	...	76	...	...	...	...	...	...	...

The results are not as outstandingly in favour of Funk's Yellow Dent as they have been in previous seasons, a fact possibly attributable to disease, this variety, in a season when diseases were rife, showing itself to be very susceptible to most of them. Leaf stripe took heavy toll of many areas during last season, but nowhere was it as rampant as in plots of Funk's Yellow Dent. One area at Dignam's Creek was practically wiped right out by this disease, the ultimate yield of the best of the paddock being only 27 bushels per acre, whilst in the same paddock other varieties yielded as high as 70 bushels per acre. Right along the coast isolated instances comparable to this were to be seen, in all cases the variety being Funk's Yellow Dent. Fortunately, there were also areas indicating that freedom from leaf stripe is possible even when this variety is grown; rotation of crops and burning of dead stalks are practices recommended for the control of the majority of maize diseases, and could well be adopted more fully by growers on the richer flats where maize has been grown for many years. Notwithstanding the facts mentioned, Funk's Yellow Dent showed up sufficiently well to be still worthy of recommendation as the best variety for grain in this district.

Leaming, a variety popular on the North Coast, has yielded very well in trials in this district during the past three seasons. This season on the average it gave heavier yields than Funk's Yellow Dent, and did not show itself as susceptible to disease. Large Red Hogan, which is fairly popular around Moruya, continues to stand out as the best of the later-maturing varieties of maize, and can be definitely recommended as the best of its class, having regularly outyielded such varieties as Fitzroy, Yellow Hogan, Pride of Hawkesbury, Yellow Moruya, &c.

The exceptionally heavy yields recorded from early-maturing varieties at Towamba may be ascribed to the wonderful fertility of the small plot on which this trial was grown. Two features stand out in this trial: one is the much heavier yield of Funk's Yellow Dent than James Dent (the latter being a somewhat similar variety from Orbost in Victoria), and the other is the low yield of Murrumbidgee White. The latter variety is one that would take the eye of many a maize-grower owing to its size of cob and grain; in fact, not until actually weighed in this trial was the lowness of the yield fully recognised.

In the trials at Bemboka, Candelo and Wolumla, which were on typical hill granite loams of this district, the yields were very fair. Here again Leaming showed out well, with Kennedy, a fairly early variety, well up. The disappointment was Hickory King. It is a proven fact that this variety will not yield heavily on the alluvial flats of this district, but it has always been noted for its ability to outdo other varieties on the hill land; this season it failed rather badly, when conditions were in favour of it doing well. It is intended to continue these trials next season, when the performances of the above-mentioned varieties will be closely watched, as this is not the first season when Hickory King has failed to uphold its reputation.

Mention must be made of the root, stem, and cob rot diseases, which are manifest in this district every season. Reduction in yield is caused by (1) defective germination, (2) reduced vigour of growth of diseased plants, (3) loss from lodged or broken stalks, (4) loss of weight in grain from improper filling, and (5) actual injury to grain. Careful selection of seed, burning of the stalks, and rotation of crops, making full use of lucerne and sown pastures in this direction, are recommended as control measures.

The Manurial Trials.

The results in the manurial trials are rather at variance in some cases, particularly in the trials on alluvial soils. It is difficult to explain why, in the trial at Moruya, the yield from no manure should be so much better than those obtained by the use of superphosphate. The plot of ground for this trial appeared to be very even in quality, yet whilst two plots without manure each yielded 91 bushels, two plots with superphosphate, sown between the two no-manure plots yielded only 69 and 74 bushels. There were many more dummy stalks to be found in the manured plots; in view of this a possible explanation is that the superphosphate encouraged early rapid growth, as it generally does, and leaf stripe, which was to be found in the crop, was more severe in its effect on this type of growth.

The trials on the poorer hill soils showed unmistakably that superphosphate has a marked effect on growth and yield of maize on this type of country. The rapidity with which the young growth on the manured plots outdistanced growth on the unmanured areas was an eye-opener to many farmers. This rapid early growth allows of earlier cultivation and therefore better weed control. A true reflex of the value of 1 cwt. superphosphate per acre is to be seen in the yields from these trials.

YIELDS of Manurial Trials (with Funk's Yellow Dent).

	Kiah (R. J. Goward)	Pambula (W. Cole)	Bega (J. Burgess).	Cobargo (P. Constable)	Moruya (J. R. Milne)	Bemboka (W. C. Wilton)	Candelo (Moffitt Bros.).	Wolumla (D. Atkins).
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Superphosphate (2 cwt.) ...	90	56	83	45	69	25	26	36
Superphosphate (1 cwt.) ..	119	63	82	50	74	24	29	34
No manure	98	52	80	36	91	10	20	24

An experiment with sulphate of ammonia was carried out at Cobargo, with the following results:—

Sulphate of ammonia (2 cwt.)	31 bus.
Sulphate of ammonia (1 cwt.) and superphospate (1 cwt.) ...	56 „
No manure	36 „

No conclusions can be drawn, however, from a single year's trial on the one plot.

Green Manure Trial.

During the summer of 1929-30 a green manure trial was commenced with Mr. H. J. Bate, "Mountain View," Tilba Tilba. Plots each of half an acre in area were sown with cowpeas, soybeans, and Japanese millet; these were ploughed under at the correct stage, and the land was prepared for maize and sown on 4th October, 1930, in rows 36 inches apart, with Fitzroy maize for silage. From the start there was an appreciable difference in the maize on the green manured plots as compared with that on a plot that had grown maize for silage the previous season. The crop was harvested on 1st March, with the following results:—

	Tons.	cwt.
Soybean plot	16	9
Cowpea plot	14	18
Japanese millet plot	11	10
Maize silage plot	6	14

SORGHUM FOR WINTER FEED.

SORGHUM thrives best in districts having a good rainfall and a long summer season. The young plants, when well established, will withstand dry weather well and rapidly respond to any rain that falls. Maize, on the other hand, if it receives a somewhat severe check through lack of moisture, seldom recovers, and matures in a stunted condition. If light frosts are experienced in the autumn the growth of sorghum is checked, and heavy frosts injure the crop, although the leaves and stems do not lose their succulence for some time afterwards; but sorghum stands longer into the winter than maize, and this fact ensures the crop a place on all farms requiring early winter green feed.

TUMUT SEED MAIZE CONTEST.

THE object of this yield contest, which was carried out under the supervision of Mr. L. S. Harrison, Special Agricultural Instructor of the Department, is to determine the best strain of the most suitable varieties for the district. Entrants submit samples of their seed, and these are grown on plots at different centres, where cultural methods, soil conditions, etc., are made as uniform as possible in order that the only factor (or at least the greatest factor) influencing yield will be the yielding capabilities of the varieties.

Two plots were sown last year; one on the property of Mr. C. C. Campbell, Gilmore (on 5th November), and the other with Mr. E. Roddy, Lacmalac (on 6th November).

TABLE of Yields.

Competitor	Variety	Yields					
		Gilmore Plot		Lacmalac Plot.		Average.	
		bus.	lb.	bus.	lb.	bus.	lb
Department of Agriculture (non-competitive).	Kennedy	74	12	65	11	69	39
Butler Bros.	Early Clarence	70	10	67	20	68	43
Department of Agriculture (non-competitive).	Funk's Yellow Dent	59	36	67	32	63	34
F. Davis	Murrumbidgee White	67	55	54	50	61	24
W. Butler	Murrumbidgee White	61	17	51	50	56	5
E. M. Anderson	Mastodon (type)	51	35	45	30	48	37

The Funk's Yellow Dent was planted too thickly on the Gilmore plot, and although this did not affect the stalk growth it interfered with cob setting.

COWRA DISTRICT UNSUITABLE FOR MAIZE GROWING.

TRIALS carried out during the last three seasons at Cowra Experiment Farm have demonstrated the futility of attempting to grow maize for grain on wheat lands of which Cowra district is typical. In 1928 and 1929 the trial crope failed entirely, and even under the favourable seasonal conditions experienced last year, and notwithstanding that the quickets maturing commercial varieties were sown, the highest yield (from Duncan) was only 4 bushels per acre. Early Morn yielded 2 bus. 52 lb., Rumski 1 bus. 35 lb., and Golden Glow 1 bus. 27 lb., while Iowa Silvermine failed entirely.

WOOL PRODUCTION FIGURES FOR 1930–31.

THE total wool production for New South Wales for 1930-31 (including skin wools) was 427,220,000 lb., being 32,750,000 lb., or 7 per cent., less than in the previous season. The value of wool produced in 1930-31 was £15,486,000 as compared with £20,123,000 in 1929-30 and £33,206,000 in 1928-29.

Virus Diseases of Potatoes.

CONTROL METHODS FOR TABLELAND GROWERS.

C. J. **MAGEE, M.Sc.,** B.S.Agr., Assistant Biologist.

THE attention of potato growers in the tableland areas is again called to the importance of the virus or degeneration diseases in relation to successful potato production. These diseases are the chief cause of "running out" of varieties, low yields, and high percentages of small tubers in the crop. Leaf-roll and mosaic are the most important diseases of this type with which growers in this State have to contend. These diseases are carried over from season to season in infected tubers and are spread throughout a crop by the agency of a definite type of insect, viz., aphids.

The stud-plot method constitutes the only successful means of eliminating these diseases from a crop. In this method the grower concentrates on improving a small portion of his crop by removing all infected and off-type plants, and then saves the entire yield of this portion for seed for the following year.

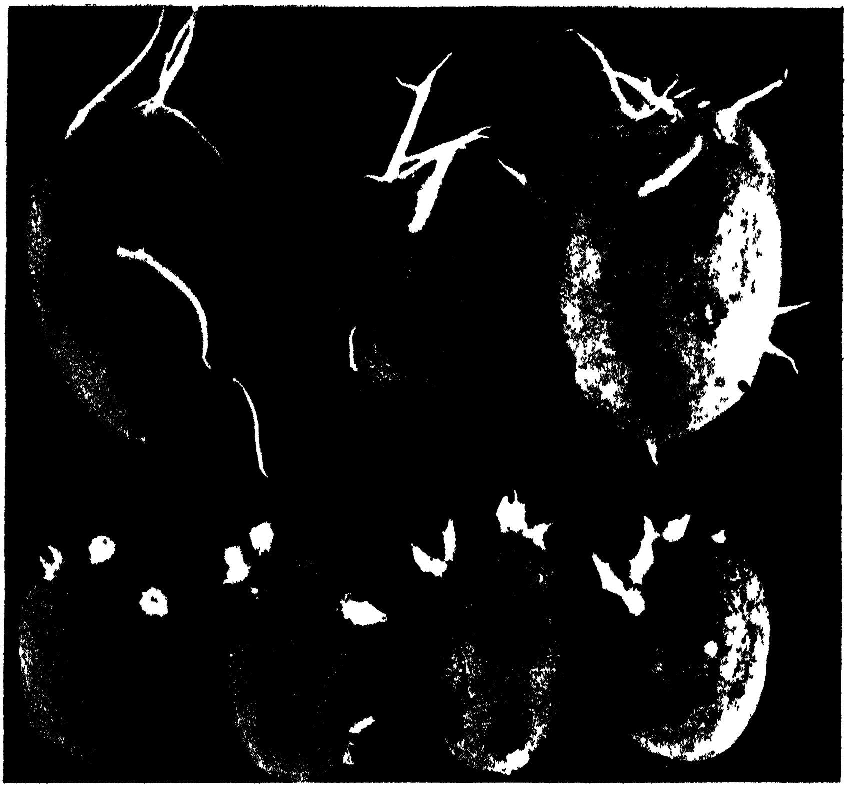
The control of potato virus diseases lies primarily in the selection of disease-free seed, since it is from the seed that infection originates each year. It is not sufficient to select seed in the barn, since leaf-roll and mosaic cannot be detected with certainty in the tubers. Further, a large percentage of the tubers derived from infected plants are of such a size that they would normally be selected as seed.

The idea is too prevalent among growers that any lot of potatoes of uniform type and small size will, of necessity, make good seed. It is common to grade a crop into "tables," "seed," and "pig." If it were not for the general prevalence of degeneration diseases, seed might well be selected on this basis of size, but at the present time this method cannot be too strongly condemned. It should be realised that under normal conditions in New South Wales, as in other parts of the world, all stock has a tendency to "run out," and that to maintain quality special efforts have to be made. Selection of seed should be carried out in the field, where the nature of the foliage may be used as a guide to what may be expected of the tubers selected.

The Value of the Stud Seed Plot.

The maintenance by each grower of a small stud seed plot of sufficient size to supply enough seed for his main crop and stud plot the following year will help to solve the problem of procuring healthy seed. Special attention must be given to this plot, which will occupy about one-tenth to one-twelfth of the total area under potatoes. It should be isolated as far as possible from other potato crops grown on the farm or neighbouring farms to reduce the chance of insect transmission of disease. The distances virus diseases may be carried vary under different conditions, but a distance of 75 to 100 yards should afford ample isolation. Any necessary fencing should be attended to before planting in order to keep stock out of the plot.

The seed used in planting the seed-production plot should be of the best quality procurable, both in its freedom from disease and trueness to type. This is where difficulty may arise on the first adoption of the stud-plot method unless some selection has been practised in the preceding season by staking outstanding healthy plants and digging them separately. If this has not been done the best the grower can do, granted that his bulk seed is up to the standard of the district, is to pick out from his bulk more than sufficient seed for the plot and allow it to sprout under close observation for a few weeks. If the seed has already long sprouts they should be broken off and the tubers should be packed in cases and stored in a dark place to sprout a second time. By carefully picking over this seed after sprouting, all the weak-sprouted tubers (see illustration) can be discarded, and among them will go many of those infested with leaf-roll. The selected tubers



Potatoes Sprouted in the Dark.

Only tubers showing stubby shoots should be selected for the stud plot.
***Above.*—Leaf-roll infected tubers. *Below.*—Healthy tubers.**

should then be transferred to a well-lighted shed and spread out to green for a few weeks before planting in order to harden off the shoots. Seed should be examined while sprouting for the presence of aphids, which may be easily killed by spraying with nicotine solution.

"Rogueing," or the eradication of all diseased and off type plants, is the most important operation in the handling of a stud seed plot. The plot should be gone through very carefully at least three times—once when the plants are about 9 inches high, again at blossoming time, and later before the tops have begun to die off. Undesirable plants of all types should be removed, their tubers being carefully dug out. The last inspection is necessary to detect plants which are affected with Fusarium wilt The presence of virus diseases can best be detected at flowering time, although severely affected plants may be distinguished very early in the season.

Cultivation of the seed production plot should be very thorough, since weeds harbour aphids the most important agents in transmission of virus diseases. It is preferable that the plot be located on good soil, since a high yield is desirable All tubers from the stud plots, including table size, should be used as seed for the next season's crop.

It has been found that on account of the rate of natural spread, rogueing of a crop for virus diseases is rarely of value if the degree of infection is above 20 to 25 per cent It is therefore imperative that seed of high quality be used in planting the stud plot.

Potatoes degenerate more quickly in coastal areas than on the tablelands. This is due to the greater prevalence of insects on the coast, which allows a more rapid accumulation of virus diseases in the stocks. On this account the stud plot method is of little value to coastal growers, and they must, therefore, depend on the tablelands for high quality seed. They can, however, exercise considerable discrimination in regard to the source from which they obtain their seed by handing their orders only to tableland growers who have given attention to freeing their crops from virus diseases.

A full account of the virus diseases of potatoes, including a description of the symptoms of leaf-roll and mosaic, appeared in the *Agricultural Gazette* of June, 1930.

INFECTIOUS DISEASES REPORTED IN SEPTEMBER.

THE following outbreaks of the more important infectious diseases were reported during the month of September, 1931:—

Anthrax	**1**
Blackleg	**2**
Piroplasmosis (tick fever)	**Nil.**
Pleuro-pneumonia contagiosa	**2**
Swine fever	**Nil.**
Contagious pneumonia	**4**
Necrotic enteritis	**Nil.**

—MAX HENRY, Chief Veterinary Surgeon.

THE SEEDLING TEST FOR BACTERIAL BLIGHT OF BEANS.

AS a precaution against the planting of bean seed that is infected with bacterial blight the Biologist of the Department of Agriculture recommends growers to employ the seedling test if there is any doubt as to the quality of the seed. This test is based on the fact that bacterial blight may be recognised in the seedlings in the form of small diseased spots which develop on the cotyledons or halves of the seed which remain attached to the stem, and as the disease advances may be recognised in the yellowish-green water-soaked spots which develop on the leaves and sometimes also on the stems.

"THE PRINCIPLES OF POTATO PRODUCTION."

VERY few industries in New South Wales are capable of greater profitable expansion than potato growing, provided, of course, that expansion takes place along sound lines. This implies a thorough knowledge of cultural practices, &c., and although much has been done in this State to demonstrate the most up-to-date methods, there may still be some points to learn from authorities in other countries. It is with this object that we draw attention to E. L. Nixon's useful little book, "The Principles of Potato Production," which is being retailed in U.S.A. at 1.25 dollars.

Our copy from the Orange Judd Publishing Co., 15 East 26th street, New York.

SUITABLE VARIETIES OF BEETROOT FOR BATHURST DISTRICT.

VARIETY trials with beetroot on the light granitic upland soil at Bathurst Experiment Farm this season confirmed the results obtained last season, namely, that, although Non Pareil is the best yielder, it matures unevenly, and is therefore more suitable for the home garden than for growing for market. On the other hand, Rapid Red, which is a much more even maturer, with round-shaped roots of good quality, is a more suitable garden type.

The yields in this year's trials were:—Non Pareil 8 tons 7 cwt. 3 qr., Rapid Red 7 tons 11 cwt. 3 qr., Egyptian Turnip-rooted 4 tons 9 cwt. 1 qr., Krempin's Combination 4 tons 2 cwt. 1 qr.

INFLUENCE OF AGE OF PUMPKIN SEED ON YIELD.

TRIALS to determine the relative values of pumpkin seed of different ages have been carried out at Bathurst Experiment Farm during the past two years. In the 1929-30 trial three-year-old seed gave the best results, while last year, when four-, five-, and six-year-old seed was tested against 1930 seed, the five- and six-year-old seed failed to germinate, while the four-year-old old seed yielded only 7 tons 19 cwt. as compared with 9 tons 9 cwt. from the 1930 seed, although the four-year-old seed yielded better quality pumpkins.

Lettuce Varieties in New South Wales.

[Continued from page 768].

N. S. SHIRLOW, B.Sc.Agr., Assistant Plant Breeder, Hawkesbury Agricultural College.

Descriptions of Varieties—*continued.*

Long Standing.

Butter type, cabbage heading; plants medium to large, fairly low growing and spreading with a fair amount of leaf in proportion to head; heads globular, fairly firm but not hard, with leaves well folded over and well blanched; leaves large, broad, coarsely blistered and crumpled, thick and fairly stiff, margins not serrated but undulating; colour, medium bright green with no reddish colouration. Seeds—blackish.

Season.—Late maturing; sure heading, and stands well in summer.

Chief Distinguishing Characters.—Not so compact as All-the-Year-Round, and has blackish seeds as compared with whitish seeds of Deacon.

May King.

Butter-head type, cabbage heading, plants medium to small, very compact with small amount of leaves compared to head; heads well blanched, and very firm, forming a large part of the plant; leaves broad, blistered and crumpled, margins entire with undulating borders, outer leaves of head inclined to turn back at edges; colour, light bright green tinged with reddish-brown mainly at borders, inner head leaves not coloured. Seeds—whitish.

Season.—Mid-season; not very suited to cold weather; stands fairly well in summer.

Quality.—Flavour soft and buttery.

Chief Distinguishing Characters.—Most like Big Boston, but more compact, having small amount of leaves compared to head and leaves more crumpled and blistered.

Mignonette.

Crisp curled type, cabbage heading; plants very compact and small; head hard, globular and well blanched, with leaves tightly folded but twisted at the edges, very few leaves in comparison to head; leaves broad, very much blistered, crumpled and twisted, stiff, finely-toothed at margins and frilled at borders; colour, dull reddish-brown and dull dark green, inner head leaves green to creamy. Seeds—blackish.

Season.—Early-maturing; grows well under cold conditions and forms good heads; does not shoot to seed quickly in summer.

Quality.—Has the disadvantage of a dull reddish appearance, but is of excellent quality—tender, crisp and sweet.

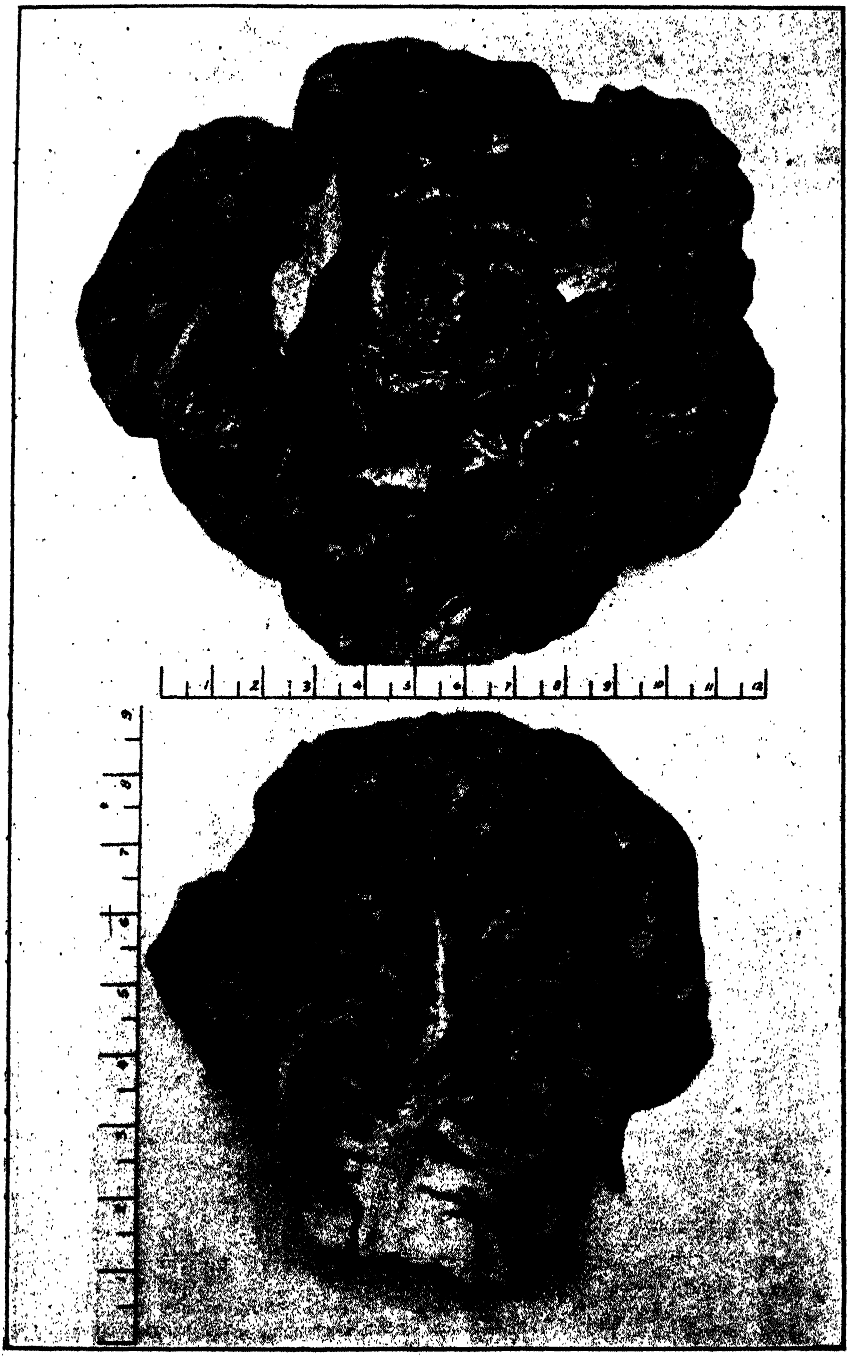


Fig. 11.—Long Standing.

Chief Distinguishing Characters.—Easily distinguished from other varieties of the class on account of reddish appearance, small size and blackish seeds.

Paris White Cos.

Cos type, self-closing; plants very large and characteristically upright in growth; leaves when young grow straight and flat, later the inner leaves become spoon-shaped, making a well-balanced, firm loaf-shaped head; leaves long and narrow, lightly blistered, especially the inner ones, thick, stiff and coarse, not twisted or crumbled, large hard mid-ribs and coarse veins, margins not toothed and fairly flat at borders; colour, medium to dark green, never brownish or reddish in any part. Seeds—whitish.

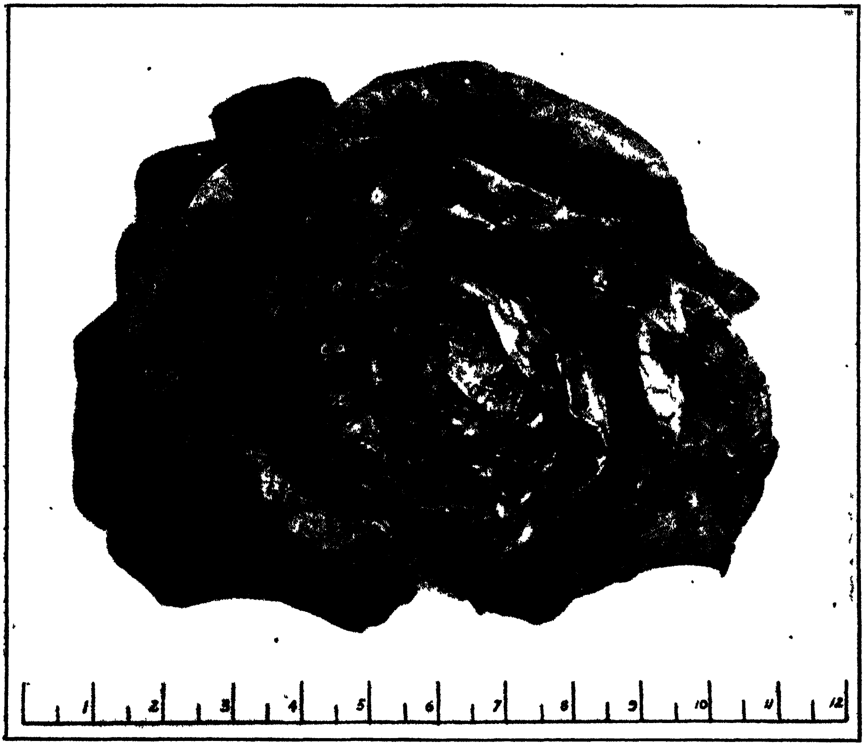


Fig. 12.—May King.

Season.—Late-maturing, stands well in summer and winter.

Quality.—Good, hard in texture but very crisp and fairly sweet.

Synonyms.—Champion White Cos, Trianon.

Chief Distinguishing Characters.—Lighter green in colour than Paris Green Cos, especially in young growth.

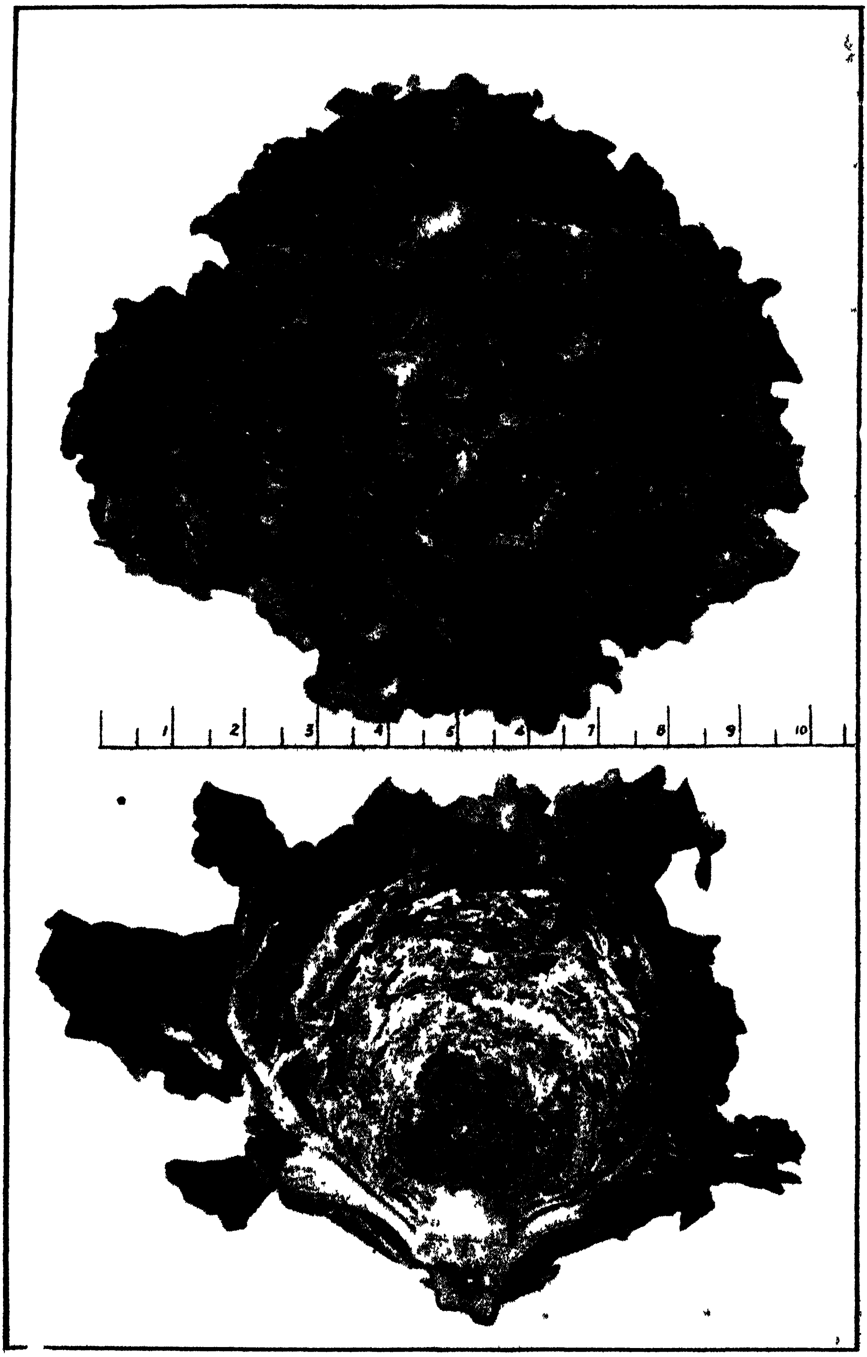


Fig. 18.—Mignonette.

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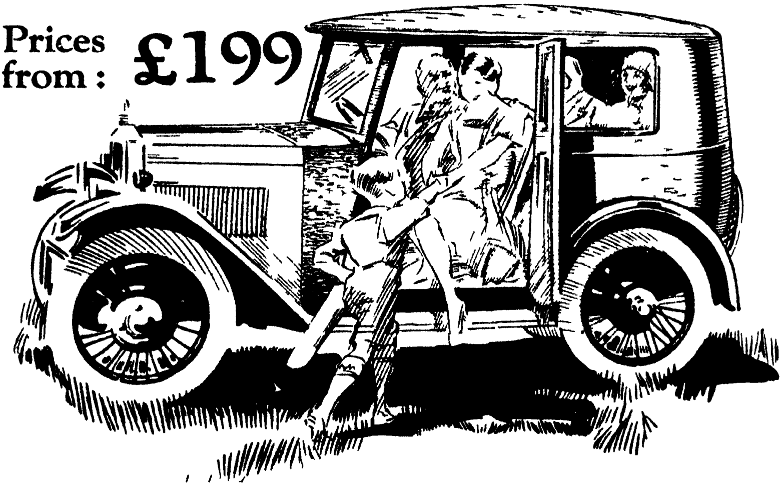

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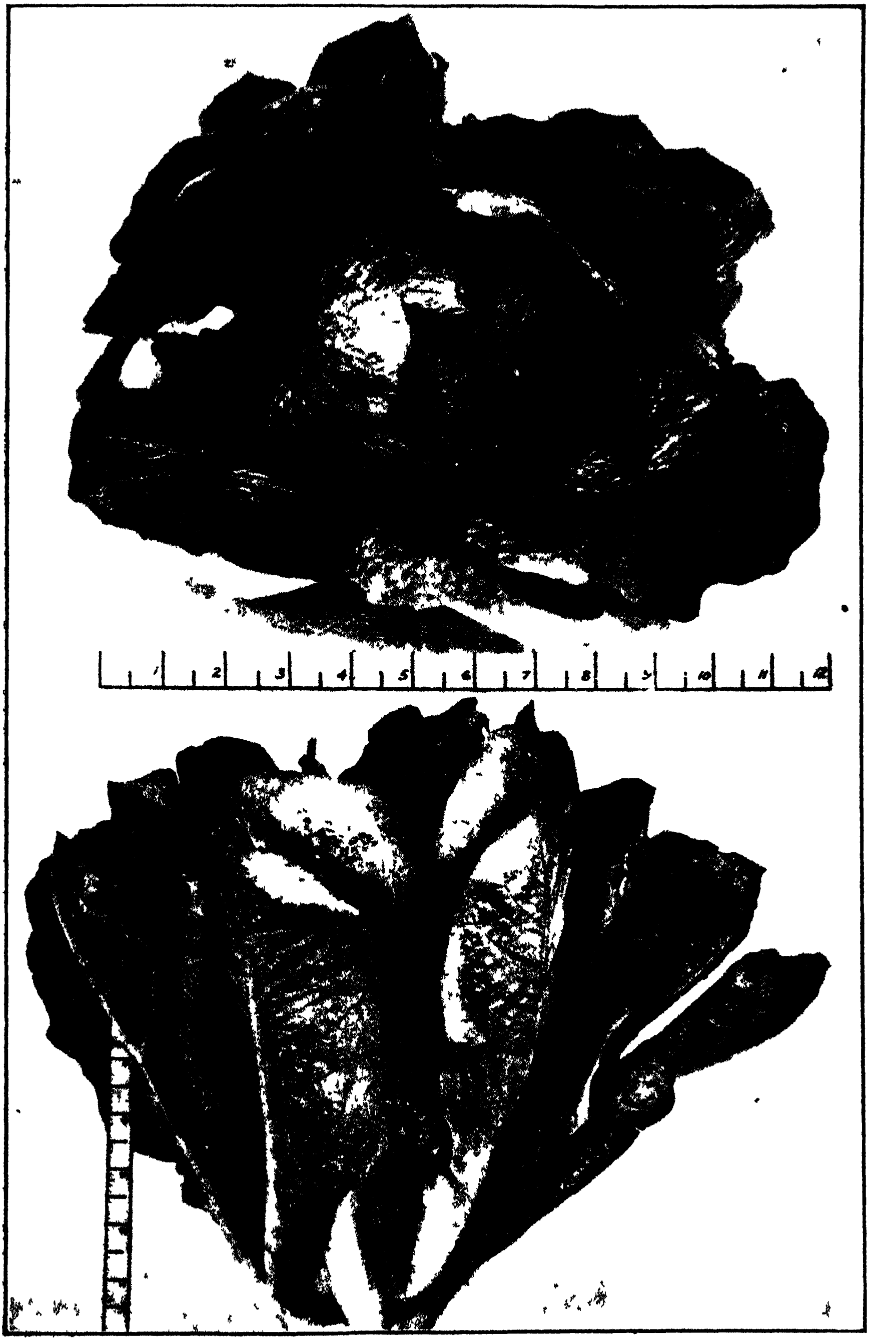


Fig. 14.—Paris White Cos.

Paris Green Cos.

Cos type, self-closing; same as Paris White Cos, but of a very dark green colour.

Tender and True.

Crisp curled type, prickly or bunching, plants medium and spreading; centre bunched more than Grand Rapids, but rarely forming a good head; leaves broad in shape, much blistered and crumpled and fairly twisted, stiff and rather coarse in appearance with heavy veins and large mid-ribs, margins, finely serrated and borders finely frilled; colour, light bright yellowish green, no part reddish Seeds—white.

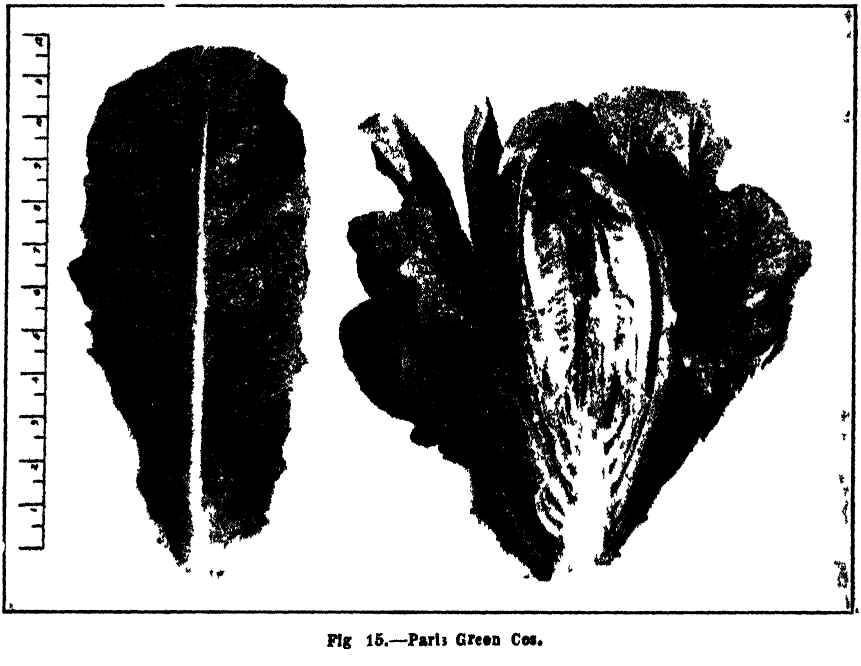


Fig 15.—Paris Green Cos.

Season.—Late maturing; grows well in winter and summer, but has very poor heading capacity.

Quality.—Crisp and sweet.

Chief Distinguishing Characters.—Young plants very similar to Hanson, but mature plants fail to form a solid head and are more yellowish in colour. Margins of leaves more frilled and with finer frilling than Evergood. Tender and True is listed in the United States as a synonym of Early Curled Simpson—white-seeded, crisp curled, non-heading. Black-seeded, crisp curled cabbage head and black-seeded butter types are also described under this name in America.

Tom Thumb.

Butter type, cabbage heading; plants very small and compact, low growing and flattened on top, forming a hard, well blanched head, which constitutes the greater part of the plant; leaves broad, small, very much blistered and crumpled, twisted, thick and stiff with slightly scalloped margins and undulate borders; colour, medium to dark green, not coloured with red or brown in any part. Seeds—blackish.

Season.—Early-maturing; stands well in summer for an early variety.

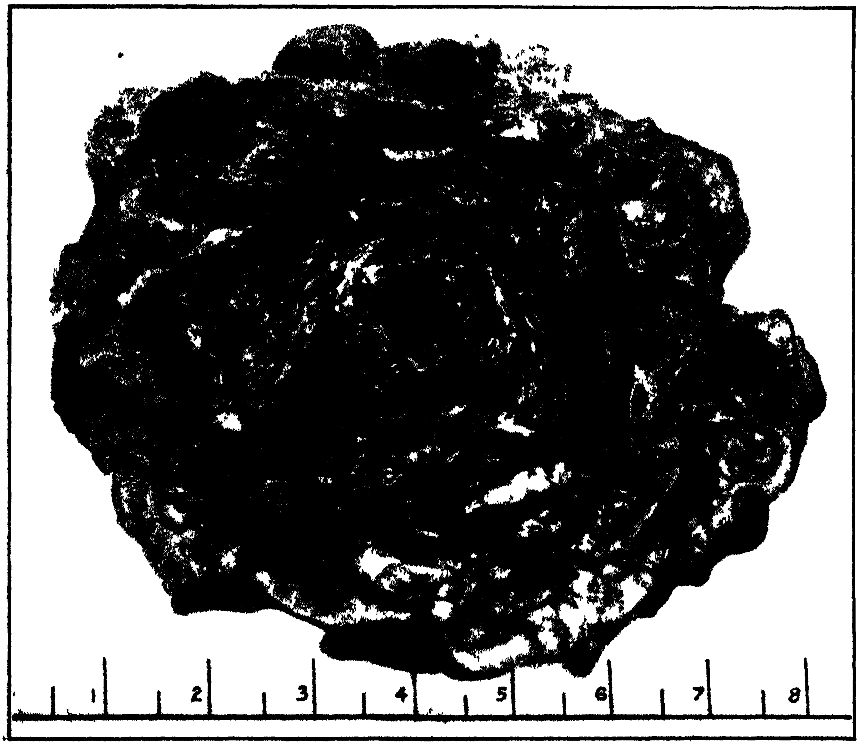


Fig. 16.—Tom Thumb.

Quality.—Good, sweet and fairly hard in texture for a butter type. Not suitable for market on account of its very small size.

Chief Distinguishing Characters.—Easily distinguished from other varieties of its class on account of exceptionally small size.

Wonderful.

Crisp curled type, cabbage heading; mature plants large, young plants inclined to spread with central portion upright; head round to slightly oval, hard, well blanched, with leaves tightly overlapping one another; leaves broad, blistered, crumpled and twisted, thick, stiff and coarse in appearance

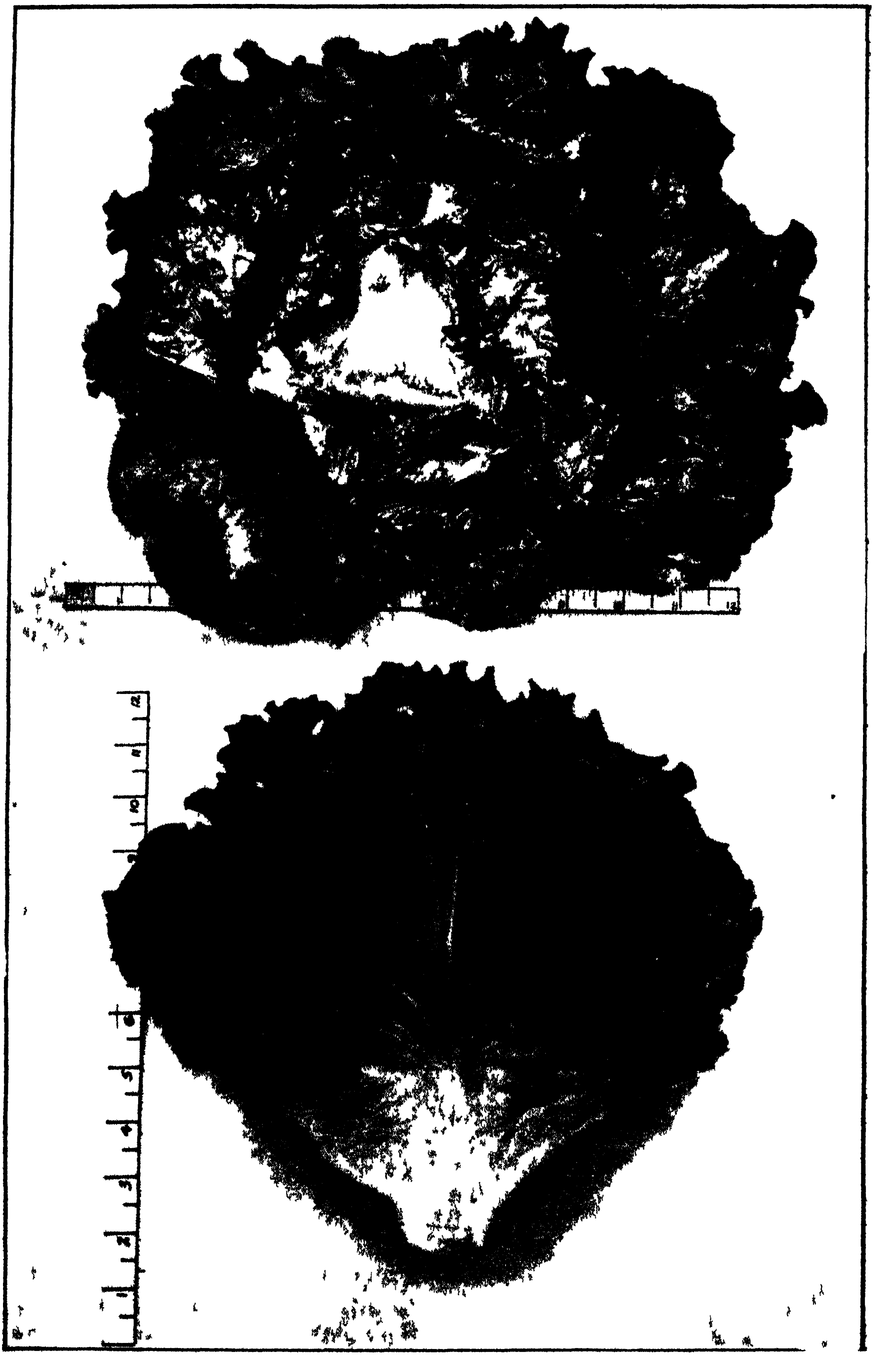


Fig. 17.—Wonderful.

with heavy veins and large mid-rib, margins finely serrated and borders frilled; colour, dark green, never brownish or reddish in any part. Seeds—whitish.

Season.—Late-maturing, sure heading both in summer and winter; stands cold conditions well and does not shoot to seed quickly in summer. One of the most widely-grown varieties for market.

Quality.—Good, very crisp, firm and sweet.

Synonyms.—Neapolitan, New York, Webb's Wonderful, Rockdale Surprise.

Chief Distinguishing Characters.—Distinguished from others of its class by the upright habit and dark-green colour.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this list, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

***Maize*—**	
Fitzroy	**Manager, Experiment Farm, Grafton.**
Large Goldmine	**P. Short and Sons, "Moore Park," Armidale.**
Murrumbidgee White	**M. Leitch, Bulgary Private Bag, Wagga.**
***Sorghum*—**	
Sumac	**Principal, Hawkesbury Agricultural College, Richmond.**
***Tomatoes*—**	
Bonny Best	**Manager, Experiment Farm, Bathurst.**
Marglobe	**Manager, Experiment Farm, Bathurst.**
***Sweet Potatoes* (cuttings only)—**	
Vineless	**S. Redgrove, Sandhills, Branxton.**
Nancy Hall	
Yellow Strassburg	
Porto Rico	
Brooks' Seedling No. 3	
Director	
Pierson	
Sudan Grass	**Manager, Experiment Farm, Bathurst.** **Manager, Experiment Farm, Nyngan.**

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

The Viability of Sugar Cane Seed.

A PROBLEM IN SEEDLING RAISING IN NEW SOUTH WALES.

W. H. DARRAGH, B.Sc.Agr., Assistant Plant Breeder.

THE experience of most people associated with cane is that under ordinary conditions cane seed has a viability of only a few weeks. Types of cane differ to some extent in this respect, but generally speaking, it is universally agreed that to get the best germination, without artificial treatment, cane seed should be thoroughly dried and sown within two or three weeks after harvesting.

As cane seed is harvested in the northern part of Australia about July, which is midwinter, the seed is germinated about this time. Prior to 1928, the efforts of this Department and of the Colonial Sugar Refining Company in cane seed germination were made in glasshouses in nurseries in Sydney. With low temperatures and cloudy days, conditions were not found to be at all good for this work, and very little success was obtained. Special heating in addition to the ordinary glasshouse temperature has been found to be necessary by the Colonial Sugar Refining Company, which is continuing its work in Sydney, and transporting the seedlings later in pots to the cane districts for field planting. This Department has overcome the trouble largely by raising the seedlings in a glasshouse at Grafton Experiment Farm, where the higher temperatures and more abundant sunshine obviate the necessity for anything more than artificial heating of the house during the night.

As cane does not arrow in the latitude of New South Wales, more tropical countries have to be depended upon for a supply of cane seed each year for the seedling raising project at Grafton. Some assistance in this respect is being given by the Queensland Bureau of Sugar Experiment Stations, and by the Colonial Sugar Refining Company, which has cane stations in Queensland and Fiji.

A Plan to Extend the Range of Sources of Seed.

When the work was commenced at Grafton, it was considered desirable that the seedlings raised should cover as wide a range of material as possible. Resistance to gumming disease, mosaic and other diseases, resistance to cold, suitability to varying soil conditions, as well as suitability to commercial purposes and capacity for "cropping" at two and at one year old, are the chief characters desired for New South Wales, where the varieties at present grown are not very satisfactory in these respects.

The idea was therefore conceived of securing the co-operation of cane-breeders at private and Government cane-breeding stations in other cane-growing countries to assist us in this project. Some doubt was entertained at the time as to whether the seed would be viable, as it would, in some cases, be two or three months after harvesting before it could be sown at Grafton. An excellent response to the appeal was given by cane-breeders in India, the United States of America, British West Indies, Cuba, Hawaii, British Guiana, Virgin Islands, Porto Rico, Mauritius, &c. Many of the important cane varieties grown in Australia have come from these countries, and if viable seed could be obtained, this new method of introduction offered possibilities for the selection of suitable new canes for New South Wales without any of the attendant dangers of introducing, as previously in cane sets, any disease which is not present in Australia.

The Essentials to Successful Storage of Seed.

Hope of success in this new project was entertained because of investigations made by workers at the Hawaiian Sugar Planters' Association Experiment Station, which was reported at the fifth annual meeting of the Hawaiian Sugar Technologists in October, 1926 These investigations showed that it was possible to prolong the viability of cane seed by certain methods of storage.

In general, it is known that life processes go on in any seed after harvest, i.e., that a respiration or oxidation occurs that involves a transformation of energy and subsequent death of the seed. If these processes can be inhibited or delayed, seed will retain its germinating power (or viability) for a longer period There seems to be something in the belief that small seeds lose their viability more quickly than larger seeds. Sugar cane seed is known to have a much shorter viability than most other seeds and to prolong this special means must apparently be devised for inhibiting or decreasing the respiration, which results in an early death of the seed

It was at one time considered that seed should be exposed to the air, i.e., oxygen, in order to preserve it, and that any attempt to enclose it in an air-tight receptacle would prove harmful to the life of the seed. This idea probably originated from the repeated failures of storing seed which was not thoroughly dry in an air-tight vessel, with the result that the seed heated or moulded and was thus destroyed. It is now known that with thoroughly air-dried seed its enclosure in an air-tight receptacle is beneficial to the life of the seed, because of the comparative absence of oxygen inhibiting or slowing down the respiration or life processes in the seed.

The early attempts to prolong the life of cane seed were on sound lines, i.e., thorough drying and enclosure in wax paper or in sealed jars or cans. In the tropics where cane is grown the atmosphere usually has a comparatively high moisture content, and naturally air-dried seed, therefore, is not really low in this figure.

Calcium chloride has long been recognised as a drying agent, and its use in storing vegetable seeds in sealed jars has been very successful in many tropical countries. The Hawaiian workers previously referred to were, however, the first, as far as is known, to make use of it in the storage of sugar cane seed. Pronounced success attended its use in early experiments by these workers, and further improvements, such as the use of an atmosphere of carbon dioxide in the sealed storage vessel, and a lowering of the storage temperature, were found to be of increased value in preserving cane seed.

On account of the period of time involved between the harvesting of the cane seed in the countries which were asked to co-operate in our seedling raising project and its subsequent germination at Grafton, it was deemed advisable to request each country supplying us with cane seed to pack the seed in a sealed jar or can with calcium chloride. Later experiments in Hawaii demonstrated that about 9 grammes of calcium chloride per 1,000 cubic feet of space was about the optimum amount to use in storage.

The first essential in the treatment of cane seed, however, is its quick drying after harvest, and in this, too, the Hawaiian workers demonstrated the value of calcium chloride in juxtaposition to the drying tassels in open tins until the seed is sufficiently dry for safe storage in sealed vessels.

Germination Results of Imported Seed at Grafton.

The germination results at Grafton of cane seed packed in different ways from various countries have indicated that undoubtedly calcium chloride is of value in the preservation of the seed.

During the past three years ninety-three samples of cane seed have been received from overseas, and the shortest time between the harvesting of the seed and its germination at Grafton has been about three or four months.

Fifty-seven samples were packed with calcium chloride, and of these thirty-four germinated. Of the samples received in waxed paper, twelve germinated and nine failed. No germination was obtained from five samples packed in paper envelopes without preservative. Of the twelve samples packed in sealed jars without preservative, one only germinated, and eleven failed to do so.

It is difficult to explain the failure in germination of some samples packed with calcium chloride, but circumstances in the setting of the seed or drying previous to storage in the country of origin must have been responsible.

Material from Cuba, packed in waxed paper without calcium chloride, gave a good germination when sown in February, as soon as it was received, but failed to germinate in July. Fuzz from Virgin Islands, packed in a linen bag without any preservative, gave an excellent germination in February, when it was received. The sample was then repacked with calcium chloride, and gave a fair germination in July. Seed from India, harvested in December, packed with calcium chloride, and held over at Grafton till the following July, gave an excellent germination, i.e., seven months after harvesting, while seed from Barbados and from United States of America, packed in the same way, even gave a good germination twelve months after harvesting.

The ability to keep cane seed viable for a period of twelve months is of considerable significance in seedling raising work, in that it enables a further sowing to be made of such seed as is apparently providing the largest number of promising seedlings.

The Lime and Phosphoric Acid Content of Lucerne.

AS INFLUENCED BY THE APPLICATION OF SUPERPHOSPHATE.

A. A. RAMSAY, F.C.S., F.A.I.C., Chief Chemist, and E. L. GRIFFITHS, B.Sc., Senior Chemist.

AN investigation of the effect, if any, of an application of superphosphate on the lime (CaO) and phosphoric acid (P_2O_5) content of lucerne was carried out by the writers. Chemical analyses were made of several cuts of lucerne at the bud stage from areas manured with 1 cwt. superphosphate per acre and from unmanured areas at Cowra Experiment Farm, Hawkesbury Agricultural College (Richmond), and Grafton Experiment Farm. The details of these are given in Table 1, in which are also shown the weight per acre of lucerne obtained at times of cutting, and the number of pounds of lime and phosphoric acid in the lucerne so obtained.

We are indebted to the Experimentalists at the institutions named for the data with regard to yields and for collecting and forwarding the samples for analysis. The samples were forwarded by post immediately after cutting. On arrival at the chemical laboratory they were chaffed and the moisture content determined on an aliquot. The remainder was air-dried and ground, and the analysis carried out by one of us (E.G.) on the ground samples, the methods followed being those of the A.O.A.C.

The Variations in Yield at the Three Centres.

Inspection of the Table 1 shows that the yields of lucerne (on a moisture-free basis) per acre obtained on the manured and unmanured areas at the three stations vary very considerably, and also that the yields at the same station show quite remarkable differences. It will be noted that while 470 lb. dry matter per acre was obtained from the manured area in October at Cowra Farm, 1,006 lb. per acre was obtained at the College and 3,187 lb. per acre at Grafton, and that while the second cut at Cowra yielded 726 lb. per acre, the second cut at the College yielded 2,278 lb. and the second cut at Grafton 4,293 lb. dry matter per acre. The third cut at the College fell to 273 lb., while that at Grafton was 1,981 lb.

The above differences may be, and probably are, largely if not entirely due to climatic conditions and the rainfall obtaining.

It is difficult, however, to offer an adequate explanation for the differences in yield between manured and unmanured areas. In the Cowra series, 470 lb. was obtained from the manured area and 443 lb. from the unmanured area in the first cut, but in the second cut 726 lb. was obtained from the manured area and only 487 lb. from the unmanured area. In the

College series 1,006 lb. per acre was obtained from the manured area and 871 lb. from the unmanured area in the first cut (21st October, 1929), 2,278 lb. from the manured and only 1,345 lb. from the unmanured area in the second cut (20th November), and 273 lb. from manured area and 283 lb. from the unmanured area in the third cut (11th February, 1930).

In the Grafton series 3,187 lb. per acre was obtained from the manured area and 3,311 lb. from the unmanured area in first cut; 4,293 lb. from the manured area and 4,688 lb. from the unmanured area in the second cut; 1,981 lb. from the manured area and 1,832 lb. from the unmanured area in the third cut; 1,965 lb. from the manured area and 2,166 lb. from the unmanured area in the fourth cut, and 2,560 lb. from the manured area and 2,150 lb. from the unmanured area in the fifth cut.

It will be noted that in the Cowra series (two cuts) both yields were higher from the manured area, in the College series (three cuts) yields were higher on two occasions from the manured area, and in the Grafton series (five cuts) the yields from the manured area were higher on two occasions only.

In the whole series (ten cuts) yields from the manured areas were higher on six occasions and lower on four occasions.

Since the application of superphosphate has resulted in increasing the yield in only 60 per cent. of the trials and has apparently depressed the yield in 40 per cent. of the trials, there is nothing to warrant the assumption that the application of superphosphate would be reflected in any definite or in any positive way in the chemical composition of the ash of the lucerne grown on the area so treated. The composition of the ash appears to depend on quite a number of other factors.

The Yields Calculated to 100-day Periods.

Since the yields of lucerne recorded from manured and unmanured areas on the various dates at Cowra, Hawkesbury College, and Grafton show certain irregularities, and since the trials at Cowra were over a period of fifty days, those at the College over a period of 113 days and those at Grafton over a period of 259 days it was considered that if the total yield of lucerne obtained at each station was calculated to a 100-day period in each case, any irregularities at individual dates would be less pronounced, and such a calculation would afford a more valid representation of the weight of lucerne harvested and of the number of pounds of lime (CaO) and phosphoric acid (P_2O_5) contained in the lucerne and therefore removed from the soil. This has been done, and the data is presented in Table II showing (*a*) calculated yield of lucerne per acre on a moisture-free basis from manured and unmanured areas, (*b*) the true average percentage of lime and phosphoric acid in the lucerne harvested at the three stations, (*c*) the number of pounds of lime and phosphoric acid in the lucerne harvested from one acre at each of the three stations (computed on (*a*) and (*b*), and (*d*) the true average percentage of lime and phosphoric acid in manured and unmanured lucerne.

Inspection of item (*a*) in Table II shows that at Cowra each acre of the manured area yielded 28.6 per cent. more lucerne than an acre unmanured; at the College an increase of 42.4 per cent. was obtained from the manured area; but at Grafton a slightly decreased amount (1.1 per cent.) was obtained from the manured area.

The yield of lucerne per acre from manured and unmanured areas at the College in the 100-days' period was one-fourth more than that obtained at Cowra, but at Grafton it was rather more than two and one-half times as much. The total yield of lucerne from manured areas at all three stations is only slightly more than one seventh in excess of the yield from unmanured areas.

It is apparent, therefore, that some factor or factors other than the application of the superphosphate is responsible for the remarkable differences in yields.

Items (*b*), (*c*), and (*d*) will be discussed at a later stage in this article.

The Lime Content.

Table I shows that the percentage of lime is subject to very considerable variation, not only in the various districts but even in subsequent cuts in the same district, and that this variation applies equally to manured and to unmanured areas.

The percentage of lime in lucerne from areas to which superphosphate has been applied ranges from 1.63 to 2.77, being a difference of 1.14, or approximately 70 per cent. In the case of lucerne from untreated areas it ranges from 1.61 to 2.42, being a difference of 0.81 or approximately 50 per cent.

At Cowra the lime content in the first cut from the manured area is 2.77 per cent., and it falls to 2.27 in the second cut, a decrease of 0.50 or 18 per cent. In the first cut unmanured it is 2.37, and in second cut 1.94, a decrease of 0.43 or 18 per cent.

At the College the lime percentage in the first cut from the manured area is 2.73; it falls to 2.11 in the second cut, a decrease of 0.62 or 22.8 per cent., and increases to 2.62 in the third cut, an increase of 0.51 or 24.1 per cent. over that in the second cut, but a decrease of 0.11, or 4 per cent. when compared with the first cut.

At Grafton the subsequent cuts, when compared with the first cut, show the following increases or decreases respectively:— — 0.12, + 0.06, — 0.17, — 0.53 for manured lucerne and - 0.18, + 0.11, -- 0.23, — 0.61 for unmanured lucerne.

The "rough average" of the percentage of lime in the Cowra series is 2.52 in manured lucerne and 2.16 in the unmanured lucerne; *i.e.*, the latter contains 14.3 per cent. less than the former. The rough average of the College series is 2.49 for manured lucerne and 2.24 for unmanured lucerne; *i.e.*, the latter contains 10.0 per cent. less than the former. The rough average of the percentage of lime in the Grafton series is 2.01 for manured and 2.03 for unmanured lucerne; *i.e.*, the latter contains 10 per cent. more lime than the former.

For the whole series the rough average percentage of lime in manured lucerne is 2.25 and in unmanured lucerne 2.12; *i.e.*, the latter contains 5.8 per cent. less lime than the former.

As the weight of lucerne per acre obtained at the three stations and in individual cuts at the same station shows a remarkable variation, the "true average" percentages of lime in the lucerne from manured and unmanured areas have been calculated, and are given in Table III. These values are, it is considered, a better indication of the lime content of the lucerne than the "rough averages" of the individual analyses.

Inspection of this data shows that in the Cowra series the true average percentage of lime in lucerne manured with superphosphate is 2.473, while the unmanured lucerne contains 2.148, or 13 per cent. less lime than the manured lucerne. In the College series the lime content of manured lucerne is 2.326 and of unmanured lucerne 2.144, or 7.8 per cent. less lime than the manured lucerne. In the Grafton series the lime content of manured lucerne is 2.011 and of unmanured lucerne 2.039; *i.e.* the manured lucerne contained 1.37 per cent. less lime than the unmanured.

In the whole series the true average percentage of lime in manured lucerne is 2.100 and in unmanured lucerne 2.060; *i.e.*, the manured lucerne contains 1.9 per cent. more lime than the unmanured lucerne.

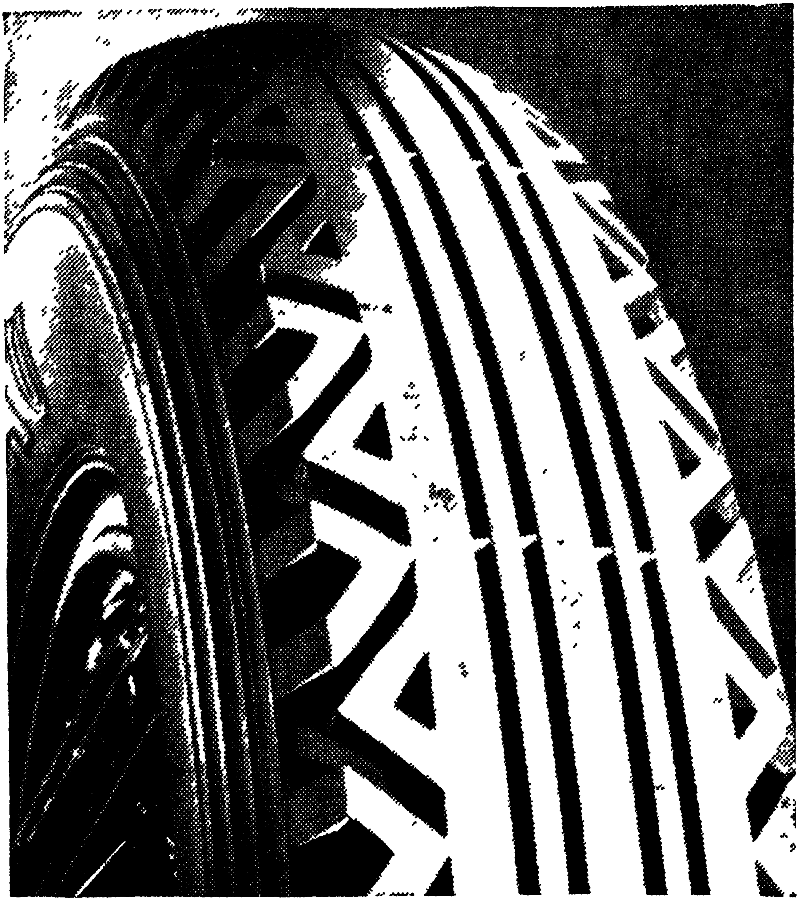
The Percentage of Phosphoric Acid.

With regard to the amount of phosphoric acid in the lucerne grown, inspection of the data in Table I shows that this is also subject to considerable variation both in regard to lucerne from manured areas and from unmanured areas.

The percentage of phosphoric acid in the lucerne grown on areas to which superphosphate had been applied ranges from 0.61 to 0.91—a difference of 0.30, or approximately 50 per cent., and in the case of lucerne from untreated areas, the range is from 0.5 to 0.90, a difference of 0.38, or approximately 73 per cent.

In Cowra lucerne the phosphoric acid in the first cut from the manured area is 0.65, and in the second cut 0.61, a difference of 0.04, or approximately 6.5 per cent. In the first cut from the unmanured area it is 0.57, and in the second cut 0.55, a difference of 0.02, or approximately 3.5 per cent.

At the College the phosphoric acid in the first cut lucerne from manured area is 0.61, and rises to 0.63 in the second cut, a difference of 0.02, or



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approximately 3.2 per cent. This again increases in the third cut to 0.70 per cent, being an increase of approximately 13 per cent over the amount present in the first cut and 10 per cent. more than in the second cut. Phosphoric acid in the first cut from the unmanured area is 0.52, and in second cut is also 0.52. In the third cut it increases to 0.61 per cent., or 17 per cent. more than in the first and second cuts.

At Grafton the amount of phosphoric acid in the first cut lucerne from the manured area is 0.91 per cent.; in the second cut it is 0.65 per cent. (a decrease of 28.6 per cent.) on the amount present in first cut; in the third cut it rises to 0.77 per cent., an increase of 18.[illegible] per cent on that present in the second cut, but 15.4 per cent. less than that present in first cut. In the fourth cut it rises again to 0.83, an increase of 8 per cent. on that present in the third cut, but still 8.8 per cent. less than that in the first cut. In the fifth cut it is 0.87 per cent., being an increase of approximately 5 per cent. on that present in the fourth cut, but a decrease of approximately 4.4 per cent of that present in the first cut.

The amount of phosphoric acid in the first cut lucerne from the unmanured area is 0.84 per cent.; in the second cut the amount falls to 0.61 per cent., a decrease of 27.4 per cent. In the third cut lucerne the amount rises to 0.74 per cent., an increase of 21.3 per cent. on that in second cut lucerne, but still 11.9 per cent. less than in first cut lucerne. In the fourth cut the amount rises, and is 0.90 per cent., being an increase of 21.6 per cent. on the amount in third cut, and also an increase of 7 per cent on amount present in the first cut. In the fifth cut the amount is 0.87 per cent., being a decrease of 3.4 per cent. on that in fourth cut, but an increase of 3.5 per cent. on that present in the first cut.

The rough average of the percentage of phosphoric acid in the Cowra series is 0.63 per cent. in manured lucerne and 0.56 per cent. in unmanured lucerne, the latter containing 11.1 per cent. less than the former. The rough average percentage of phosphoric acid in the College series is 0.65 per cent. in manured lucerne and 0.55 per cent. in unmanured lucerne, the latter containing 15.4 per cent. less than the former. The rough average in the Grafton series is 0.81 per cent. in manured lucerne and 0.79 per cent. in unmanured lucerne, the latter containing only 2.5 per cent. less than the former.

For the whole series the rough average percentage of phosphoric acid in lucerne manured with 1 cwt. per acre of superphosphate is 0.72 per cent., and 0.67 per cent. in unmanured lucerne; *i.e.*, the former contains 7.2 per cent. more phosphoric acid than the latter.

For the reason mentioned in connection with the discussion of the lime content, the true average percentage of phosphoric acid in lucerne from manured and unmanured areas has been calculated, and is given in Table III.

Inspection of this data shows that in the Cowra series the true average percentage of phosphoric acid in lucerne to which superphosphate has been applied is 0.627 and in unmanured lucerne 0.537, the latter containing 14.3 per cent. less phosphoric acid than the former. In the College series the true average of manured lucerne is 0.629 per cent., and of unmanured lucerne 0.528 per cent., the latter containing 15.9 per cent. less phosphoric acid than the former. In the Grafton series the true average percentage in manured lucerne is 0.792, and in unmanured lucerne 0.765, the latter containing 3.8 per cent. less phosphoric acid than the former.

In the whole series the true average percentage of phosphoric acid in manured lucerne is 0.751 and in unmanured lucerne 0.719, the manured lucerne containing 4.5 per cent. more than the unmanured lucerne.

The Ratio of Phosphoric Acid to Lime.

The ratio of phosphoric acid to lime in the lucerne grown at the localities chosen is not without interest.

It will be noted from Table I that in the Cowra lucerne the ratio of phosphoric acid to lime in manured lucerne is 1 to 4.00, and 1 to 3.86 in unmanured lucerne In lucerne grown at the College the ratio is 1 to 3.83 in manured lucerne and 1 to 4.07 in unmanured lucerne. In Grafton lucerne the ratio is 1 to 2.48 in manured lucerne and 1 to 2 57 in unmanured lucerne.

It will be seen that Cowra- and College-grown lucerne, both manured and unmanured, contain over 50 per cent. more lime per unit of phosphoric acid than Grafton-grown lucerne.

In the whole series the ratio of phosphoric acid to lime in all manured lucerne ranges from a maximum of 1 to 4.48 to a minimum of 1 to 1.87, and averages 1 to 3.12. In all unmanured lucerne the ratio ranges from a maximum of 1 to 4.65 to a minimum of 1 to 1.85, and averages 1 to 3.16.

Summary and Conclusions.

1. The yields of lucerne cut in the bud stage (manured and unmanured) vary very considerably from a minimum of 273.8 lb. per acre to a maximum of 4,688.7 lb. (moisture-free basis).

2. Over the whole of the ten cuts the application of 1 cwt. superphosphate resulted in increasing the yield in 60 per cent. of the cuts and apparently depressed it in 40 per cent. This does not support the view that the application of superphosphate would be reflected in any definite or in any positive way on the chemical composition of the ash, but suggests that other factors are responsible for the increase or decrease in yields, and might and possibly would have an effect on the mineral composition of the lucerne.

3. In the Cowra series the yield of lucerne from the unmanured area was 22.2 per cent. less than that from the manured area; in the Hawkesbury College (Richmond) series the yield from the unmanured area was 29.8 per cent. less than from the manured area; but in Grafton series the yield from the unmanured area was 1.1 per cent. more than from manured area. In the whole of the trials (Cowra, College, Grafton) the yield from unmanured areas was 12.9 per cent. less than that from manured areas.

4. At Cowra and Hawkesbury College the rainfall is sparse and very considerably less than at Grafton. This is definitely reflected in the yield of lucerne obtained, and is probably also responsible for the marked difference in lime and phosphoric acid content of lucerne from these areas, for it will be noted that Grafton lucerne contains approximately 9 per cent. less lime and 34 per cent. more phosphoric acid than the Cowra and College lucerne.

5. The percentage of lime is subject to very considerable variation not only in the various districts, but also in subsequent cuts in same district. This applies equally to manured and unmanured areas.

6. The percentage of lime ranges from 1.63 to 2.77 per cent. in lucerne from manured areas and from 1.61 to 2.42 from unmanured areas. These differences amount to 70 per cent. and 50 per cent. respectively.

7. The true average percentage of lime in all cuts is 2.100 in manured lucerne and 2.060 in unmanured; *i.e.*, the manured lucerne contains 1.9 per cent. more lime than unmanured lucerne.

8. The percentage of phosphoric acid is also subject to considerable variation, as in the case of lime.

9. The percentage of phosphoric acid ranges from 0.61 to 0.91 in lucerne manured with 1 cwt. superphosphate per acre, and from 0.52 to 0.90 in lucerne from unmanured areas. These differences amount to 50 per cent. and 73 per cent. respectively.

10. The true average of the percentage of phosphoric acid over the whole series is 0.751 in manured lucerne and 0.719 in unmanured lucerne; *i.e.*, lucerne manured with superphosphate contains 4.5 per cent more phosphoric acid than the unmanured lucerne.

11. In view of the fact that lime content and phosphoric acid content in the lucernes examined show variations of from 50 to 70 per cent., the difference in the percentages of lime and of phosphoric acid in lucerne manured with 1 cwt. superphosphate and in lucerne grown on similar areas to which no superphosphate has been applied is certainly small, approximating 1.9 to 4.5 per cent.

12. In the superphosphate applied there would be approximately twice as much lime as phosphoric acid. Application of 1 cwt per acre would only increase the percentage of phosphoric acid in the soil to a depth of 12 inches by 0.0008.

The chemical analysis of lucerne shows that the increase in lime and in phosphoric acid in the lucerne which was manured with superphosphate is approximately the same.

13. This and the other considerations previously discussed raise a doubt as to whether the apparent slight increase in lime and phosphoric acid is due to the manurial treatment or to climatological factors.

TABLE I.—YIELD per acre and Percentage Composition of Lime and Phosphoric Acid of Lucerne cut at the bud stage and grown on areas manured (1 cwt. superphosphate per acre) and unmanured at Cowra, Hawkesbury College (Richmond) and Grafton.

Locality.	No. of Cut.	Date.	Manured Area.				Unmanured Area.				Manured Area.		Unmanured Area.		Manured Area.	Un-manured Area.
			Weight of Lucerne per acre.	Weight of Lucerne (Moisture-free Basis) per acre.	100 lb. dry matter contains—		Weight of Lucerne per acre.	Weight of Lucerne (Moisture-free Basis) per acre.	100 lb. dry matter contains—		Yield per acre.		Yield per acre.		Ratio of Phosphoric Acid to Lime.	Ratio of Phosphoric Acid to Lime.
					Lime.	Phosphoric Acid.			Lime.	Phosphoric Acid.	Lime.	Phosphoric Acid.	Lime.	Phosphoric Acid.		
			lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.		
Cowra Experiment Farm ...	1	8 Oct. 1929	1,467·1	470·6	2·77	0·65	1,361·2	443·6	2·37	0·57	13·1	3·1	10·5	2·5	1 : 4·26	1 : 4·16
	2	27 Nov., 1929	2,480·5	726·5	2·27	0·61	2,178·0	487·4	1·94	0·55	16·5	4·4	9·5	2·5	1 : 3·72	1 : 3·53
Mean for Cowra ...	...	...	...	...	2·52	0·63	...	..	2·16	0·56	...	...	...	...	1 : 4·00	1 : 3·86
Hawkesbury Agricultural College (Richmond).	1	21 Oct., 1929	3,796·4	1,006·4	2·73	0·61	3,206·5	871·2	2·42	0·52	27·5	6·1	21·1	4·5	1 : 4·48	1 : 4·65
	2	20 Nov., 1929	7,759·1	2,278·8	2·11	0·63	5,959·2	1,345 5	1·91	0·52	48·1	14·4	25·7	7·0	1 : 3·35	1 : 3·67
	3	11 Feb., 1930	756·2	273·8	2·62	0·70	771·4	283·0	2·39	0·61	7·2	1·9	6·8	1·7	1 : 3·74	1 : 3·92
Mean for Hawkesbury Agricultural College.	...	...	...	...	2·49	0·65	...	...	2·24	0·55	...	..	...	...	1 : 3·83	1 : 4·07
Grafton Experiment Farm...	1	21 Oct., 1929	13,294·0	3,187·9	2·16	0·91	13,416·5	3 311·2	2·21	0·84	68·9	29·0	73·2	27·8	1 : 2·37	1 : 2·63
	2	9 Dec., 1929	11,283·2	4,293·2	2·04	0·65	11,132·0	4,688·7	2·03	0·61	87·6	27·9	95·2	28·6	1 : 3·14	1 . 3·33
	3	10 Feb., 1930	6,760·1	1,981·3	2·22	0·77	5,596·2	1,832·7	2·32	0·74	44·0	15·3	42·5	13·6	1 : 2·88	1 : 3·14
	4	1 April, 1930	8.167·5	1,965·1	1·99	0·83	9,861·5	2,166·5	1·98	0·90	39·1	16·3	43·0	19·5	1 : 2·40	1 : 2·20
	5	7 July, 1930	11,797·5	2,560·0	1·63	0·87	10,709·5	2,150·4	1·61	0·87	41·7	22·3	31·6	18·7	1 : 1·87	1 : 1·85
Mean for Grafton ...	...	...	...	...	2·01	0·81	...	...	2·03	0·79	...	.	...	...	1 : 2·43	1 : 2·57
Mean of Whole Series...	...	...	..	...	2·27	0·72	...	..	2·12	0·67	...	..	...	...	1 : 3·12	1 · 3·16

TABLE II.—RECORDED Yields of Lucerne calculated to a One-hundred day Period.

Locality	Calculated dry matter yield per acre for 100-days period	Percentage composition (True average)		Amounts removed per acre per 100 days		Amounts removed per 1,000 lb. lucerne (dry matter)	
		Lime.	Phosphoric Acid.	Lime	Phosphoric Acid	Lime.	Phosphoric Acid.
	lb.	%	%	lb.	lb.	lb.	lb.
Manured Lucerne.							
Cowra	2,394·2	2·473	·627	59·21	15·01	24·73	62·70
H.A. College (Richmond)..	3,149·6	2·326	·629	73·26	19·81	23·26	62·90
Grafton	5,400·6	2·011	·792	108·60	42·77	20·11	79·20
Mean	3,648·1	2·270	·683	80·36	25·86	22·70	68·27
True average ...	...	2·100	·751	...	..	...	...
Unmanured Lucerne.							
Cowra	1,862·0	2·148	·537	40·00	10·00	21·48	53·70
H.A. College (Richmond)..	2,212·1	2·144	·528	47·43	11·68	21·44	52·80
Grafton	5,463·1	2·039	·765	111·39	41·79	20·39	76·50
Mean	3,179·1	2·110	·610	66·27	21·16	21·10	61·00
True average ...	.	2·060	·719	...	. .	...	...

TABLE III.—"ROUGH" and "True" Average Percentages of Lime and Phosphoric Acid in Manured and Unmanured Lucerne.

Locality	No. in Series.	Percentages of Lime and Phosphoric Acid in Lucerne (Moisture-free basis)							
		Rough average				True average			
		Manured		Unmanured		Manured		Unmanured.	
		Lime.	Phosphoric acid.	Lime	Phosphoric acid	Lime	Phosphoric acid	Lime.	Phosphoric acid.
Cowra	2	2·52	·63	2·16	·56	2·473	·627	2·148	·537
H.A. College (Richmond)	3	2·49	·65	2·24	·55	2·326	·629	2·144	·528
Grafton	5	2·01	·81	2·03	·79	2·011	·792	2·039	·765
Mean of above figures	...	2·340	·69	2·14	·63	2·270	·683	2·110	·610
True average of above figures (calculated on number of cuts)	...	2·256	·726	2·119	·672	2·198	·710	2·092	·648
True average (calculated from lb. CaO and P_2O_5 in dry matter)	...	...	...	...	...	2·100	·751	2·060	·719

TUBERCLE-FREE HERDS.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Wolaroi College, Orange	10	4 Nov., 1931
Riverstone Meat Co., Riverstone Meat Works, Riverstone	104	11 ,, 1931
E. S. Cameron, Big Plain, Narrandera	28	14 ,, 1931
J. L. W. Barton, Wallerawang	17	17 ,, 1931
J. F. Dowe, "Woolomol," Tamworth	59	19 ,, 1931
Newington State Hospital and Home	108	24 ,, 1931
J. F. Chaffey, Glen Innes (Ayrshires)	75	4 ,, 1931
Lunacy Department, Callan Park Mental Hospital	29	13 ,, 1931
J. Davies, Puen Buen, Scone (Jerseys)	85	14 ,, 1931
Wollongbar Experiment Farm, Lismore (Guernseys)	136	21 ,, 1931
Tamworth District Hospital	7	24 ,, 1931
Department of Education, Brush Farm, Eastwood	6	9 Dec., 1931
Bathurst Experiment Farm (Jerseys)	21	16 ,, 1931
H. A. Corderoy, Wyuna Park, Comboyne (Guernseys)	59	8 Jan., 1932
New England Girls' Grammar School, Armidale	29	10 ,, 1932
C. J. Parbery, Allawah, Bega	119	10 ,, 1932
New England Experiment Farm, Glen Innes (Ayrshires)	37	12 ,, 1932
W. Spindler, Mt. Pleasant, Bega	66	15 ,, 1932
W. T. Herbert, Racecourse Farm, Bega	68	18 ,, 1932
R. C. Dickson, Elwaton, Castle Hill (Jerseys)	17	20 ,, 1932
Lunacy Department, Morisset Mental Hospital	22	28 ,, 1932
Lidcombe State Hospital and Home	146	11 Feb., 1932
Riverina Welfare Farm, Yanco	77	25 ,, 1932
Department of Education, Yanco Agricultural High School	38	26 ,, 1932
W. M. McLean, Five Islands Road, Unanderra	78	27 ,, 1932
Mittagong Farm Homes	46	3 Mar., 1932
George Rose, Aylmerton	4	4 ,, 1932
Kinross Bros., Minnamurra, Inverell (Guernseys)	66	5 ,, 1932
P. M. Burtenshaw, Killean, Inverell	50	5 ,, 1932
Miss Brennan, Arankamp, Bowral	10	6 ,, 1932
Koyong School, Moss Vale	4	12 ,, 1932
G. A. Parish, Jerseyland, Perry	123	18 ,, 1932
Lunacy Department, Parramatta Mental Hospital	33	16 ,, 1932
Cowra Experiment Farm	32	24 ,, 1932
Hawkesbury Agricultural College (Jerseys)	115	25 ,, 1932
Rydalmere Mental Hospital	73	25 ,, 1932
Russell Lamrock, Orange	4	26 ,, 1932
St. Joseph's Convent, Reynold-street, Goulburn	3	26 ,, 1932
St. John's Boys Orphanage, Goulburn	9	26 ,, 1932
Marion Hill Convent of Mercy, Goulburn	9	26 ,, 1932
Lunacy Department, Kenmore Mental Hospital	79	27 ,, 1932
St. Joseph's Girls Orphanage, Kenmore	9	27 ,, 1932
J. P. McQuillan, Bethungra Hotel, Bethungra	14	1 April, 1932
St. Michael's Novitiate, Goulburn	5	26 ,, 1932
James Wilkins, Jerseyville, Muswellbrook	39	28 ,, 1932
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	205	29 ,, 1932
Tudor House School, Moss Vale	8	3 May, 1932
Australian Missionary College, Cooranbong	58	6 ,, 1932
Navua Ltd., Grose Wold, via Richmond (Jerseys)	16	13 ,, 1932
E. C. Nicholson, Jillamatong, Corowa	134	2 June, 1932
Grafton Experiment Farm (Ayrshires)	194	4 ,, 1932
Hurlstone Agricultural High School, Glenfield	58	9 ,, 1932
P. Ubrihien, Corridgeree, Bega	133	3 July, 1932
St. John's College, Woodlawn, Lismore	32	11 ,, 1932
Gladesville Mental Hospital	40	14 ,, 1932
William Thompson Masonic School, Baulkham Hills	45	16 ,, 1932
W. Hammond, Bellingen	68	16 ,, 1932
W. R. Boughton, Holbrook	22	27 ,, 1932
Chapman Bros., Farm 166, Stoney Point, Leeton	19	28 ,, 1932
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	13 Aug. 1932
W. S. Turnbull, Flanders Avenue, Muswellbrook	32	14 ,, 1932
A. L. Logue, Thornbro, Muswellbrook	41	14 ,, 1932
E. E. Winder, Wybong Road, Muswellbrook	46	14 ,, 1932
A. Shaw, Barrington (Milking Shorthorns)	100	20 ,, 1932
A. H. Webb, Quarry-road, Ryde	4	24 ,, 1932
E. E. McMullen, Springbrook, Holbrook	32	25 ,, 1932
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 ,, 1932
Sacred Heart Convent, Bowral	10	26 ,, 1932
Department of Education, Gosford Farm Homes	38	2 Sept., 1932
James McCormack, Tumut	98	9 ,, 1932
Wagga Experiment Farm (Jerseys)	64	16 ,, 1932
S. L. Wills, Greendale Dairy, Cowra	31	16 ,, 1932
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	16 ,, 1932
St. Patrick's College, Goulburn	7	21 ,, 1932

—MAX HENRY, Chief Veterinary Surgeon.

Mortalities in Sheep Grazing on Young Plants of *Chenopodium atriplicinum.*

H. R. SEDDON, D.V.Sc., and H. G. BELSCHNER, B.V.Sc.

CHENOPODIUM ATRIPLICINUM is a common plant of western herbage country, and is a variety of saltbush popularly known as "lamb's tongue." Incidentally it may be mentioned that the name "lamb's tongue" is also applied to a variety of plantain, but for this the name "wild sago" is more appropriate, and avoids the confusion of having two distinct plants called by the same common name.

In the winter of 1925 mortalities in sheep, due to apparently the same cause in each case, were investigated on four properties in the western district. These losses all occurred practically at the same time, and the type of grazing in each case was the same. The outstanding feature of the pasture was a very prolific growth of young *Chenopodium atriplicinum*, and the general circumstances as investigated by one of us (H.G.B.) and Stock Inspectors Ryan and Warburton suggested very strongly that this plant might be responsible for the mortalities. At the same time it seemed rather hard to reconcile this with the fact that the plant is one which occurs every year in that district, and is commonly grazed by stock without their suffering any ill effects. The seasonal conditions were such, however, that the growth of this plant had, at the time of these mortalities, been especially favoured, and for the limited period during which the mortalities occurred the sheep in question would have practically no other feed than *young* Chenopodium available to them. If the plant were poisonous, therefore, it appeared that it was poisonous (*a*) only at a young stage of growth, (*b*) only during certain seasons, and (*c*) that it required a relatively large amount of the plant to cause illness.

It was not possible at the time to test the plant at the stage at which it was suspected of being poisonous, and in tests made later of the flowering heads of the plant such were not found to be harmful to sheep.

In 1929 a similar mortality occurred in the north-western district, and this plant again came under suspicion.

Again in July, 1930, mortality of a similar nature occurred in the western district, and following this arrangements were made for supplies of the *young* plant to be forwarded to Glenfield for testing. This was done by Mr. R. O. C. King, and as a result it was found that the plant fed at this stage to sheep and to guinea-pigs was toxic if consumed in large quantities over several days. Tests wherein smaller quantities of the plant were fed were negative, and, further, the plant at later stages of growth was not found to be toxic.

Thus confirmation was obtained of a fact previously suspected, viz., that this plant might be toxic at a young stage of growth but not toxic at a later stage. Further, that if eaten in small or moderate amounts it would not be toxic, but only when animals received approximately a sole diet of it. Herbage country commonly carries a mixture of plants, but, as is well known to stockowners, during certain seasons the conditions may be such that the growth of one particular plant is extremely favoured, and stock depastured thereon may receive that plant almost, if not entirely, as a sole diet. This is particularly the case following the first winter rains after a drought, the plant in question being the first to come away.

Evidence is not lacking that certain other poisonous plants are much more dangerous at a young stage of growth than when older. In most of these the toxic principle is hydrocyanic acid, but in the case of the Chenopodium mentioned above and in certain other plants the poisonous substance is as yet unknown. Thus, there is evidence that the condition of yellow big-head in sheep is due to the eating of "summer grass" growing under certain climatic conditions, and it may be recalled that we have found that Noogoora burr may be poisonous, but only in the young (two-leaf) stage.

Fortunately, in the case of the Chenopodium it requires a comparatively large amount to bring about symptoms and death, so that it is only at those seasons when sheep receive practically a sole diet of this plant that it is likely to be harmful.

The above illustrates another point, viz., that a number of the suddenly occurring losses in sheep are to be ascribed to the type of grazing available. In some cases they are due to plants (apparently) containing a toxic principle, and in others to the diet available being of an ill-balanced nature. The elucidation of these troubles is not an easy matter owing to the varying composition of the pasture as a whole and the variation which may occur in the chemical composition of particular plants at different stages of growth. For these reasons, observations and investigations have to be conducted for more than one, not infrequently for several, seasons; each fresh fact brought to light being added to what has already been learned. Working hypotheses as to the causation of these conditions are tested out by experiment and further observation. By reporting on such mortalities to the local inspector of stock and furnishing full details of their observations, movements of the affected stock, etc., stockowners can, and do, assist very considerably in elucidating these troubles.

Reference to these losses suspected to be due to Chenopodium and other plants at young stages of growth has previously been made by us in the papers mentioned hereunder. In the case of the Chenopodium, however, it is only recently that the actual experimental proof has been secured.

REFERENCES TO EARLIER PUBLICATIONS.

1. **Belschner, H. G.**—
1926.—Journal of the Australian Veterinary Association, Vol. 2, p. 17.

2. **Seddon, H. R.**—
1924–25.—Veterinary Research Report, No. 2, p. 17.
1926–27.—Veterinary Research Report No. 4, p. 102.

The Effect of Drought Rations on Sheep.

TRIALS AT HAWKESBURY AGRICULTURAL COLLEGE.

F. WHITEHOUSE, B.V.Sc., Veterinary Surgeon, Stock Branch, and J. C. COTSELL, Assistant Sheep and Wool Instructor, Hawkesbury Agricultural College.*

AN experiment was commenced at Hawkesbury Agricultural College on 26th March, 1929, to determine the effect of feeding small rations of commonly used fodders to sheep under drought conditions over a period of twelve months. It was regarded in the light of a preliminary trial only, from which sufficient data on broad lines might be gathered to constitute a basis for further experiment work in this direction.

Forty dry Merino ewes were selected for the experiment, and conditions resembling as nearly as possible those obtaining in drought times were produced. An area of 1 acre was fenced and subdivided into eight pens. Two concrete water troughs, each one to serve four pens, and rough shelters, open at the sides and covered with twigs and brush, were provided. Pasture growth was kept down by constant ploughing, rolling, and hoeing, and wooden troughs were provided for the feeding of concentrates—hay and roughage were fed from the ground. A salt lick, comprising coarse salt 100 lb., Epsom salts 6 lb., sterilised bonemeal 20 lb., was available throughout the experiment, and owing to the prevalence of stomach worms on the property, the ewes were drenched monthly—a procedure not likely to be associated with the dry conditions that constitute a drought, though under the local conditions, which were intensified by the fouling of the soil consequent on keeping the ewes in a restricted space, it was considered necessary.

It is realised that conditions typical of western country in drought time could not be completely reproduced at the College, but it is considered that the various arrangements made compensated one another sufficiently to produce adequate drought conditions.

It is proposed to record this experiment in three articles. The present one will be a general report of the trial, the second a discussion of the comparative nutritive values of the rations fed and their effect on the growth of the sheep, and the third article will record the result of breeding from the ewes in the trial.

The Details of the Experiment.

The forty Merino ewes were divided into eight groups of five each, suitably ear-tagged for identification, and allotted to the various pens. Five ewes were run with the College flock under natural feed conditions, and used as a check pen.

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*Mr. L. H. Beveridge preceded Mr. J. C. Cotsell as Assistant Sheep and Wool Instructor and during portion of the experiment assisted in the collection of the data.

The rations fed at the commencement of the trial were as follows:—

Group I.—Oaten hay 3 lb. per head per day.
Group II.—Oaten hay 2 lb., maize 4 oz., per head per day.
Group III.—Lucerne hay 2·5 lb. per head per day.
Group IV.—Lucerne hay 1·5 lb., maize 4 oz., per head per day.
Group V.—12 oz. maize per head per day.
Group VI.—Linseed nuts 4 oz., oaten straw 3 lb., per head per day.
Group VII.—Maize 4 oz., oaten straw 3 lb. with diluted molasses, per head per day.
Group VIII.—Lucerne hay ·5 lb., maize 8 oz., per head per day.

The rations were reduced from time to time in some of the groups, the reduction being based upon the condition of the sheep and the amount of feed not ingested. All feed not eaten was removed daily so as to keep strictly to the rations and prevent any sheep obtaining more than its share. The oaten hay, lucerne and maize were grown at the College. The lucerne hay was sometimes upland lucerne, at other times river flat lucerne. Straw and linseed nuts were bought on the market, and the hay and grain were of good quality, but the straw contained some percentage of bracken fern.

The groups were weighed on 26th March, 1929 (the commencement of the experiment), and at monthly intervals throughout the trial—always before feeding at 7 a.m. The monthly average weights are shown in Table I.

GROUP I (Oaten Hay only).

The total loss in average body weight in this group was 26.4 lb. per sheep, or 32 per cent. There was a gradual decline in weight, arrested occasionaly for one or two-month periods, from the commencement of the experiment. During the first two months it was noticed that a considerable amount of hay, mainly the straw, was being left. The ration was, therefore, reduced on 14th June by 1 lb. per head. Condition was fairly well maintained through the next three months, and at the end of October, as considerable roughage was still being left and drought appearance of the sheep not evident, the ration was further reduced to 1 lb. of hay per day, although by this date the sheep had lost 16.4 lb., and were apparently entering the stage of drought metabolism. Throughout December and January the sheep became more drought stricken in appearance, very weak, with sunken eyes and halting gait; by February they were emaciated, and very low, and on the 26th of that month it was considered necessary to supplement their ration by 0.5 lb. lucerne hay. All the oaten hay had been consumed since the November reduction. Had a cold snap occurred it is doubtful whether these sheep would have survived. The lucerne hay was fed until the end of the trial, that is for six weeks, and, though there was still a small drop in weight, the sheep appeared much brighter and more energetic.

Two deaths occurred early in the period (20th April and 26th May), and in the second case earth ingestion was very marked. With this ewe the immediate cause of death was probably the absorption, through a gastric mucous membrane already abraded by sand, of the drench administered the previous day—the ingestion of the sand being facilitated by recent ploughing of the pens.

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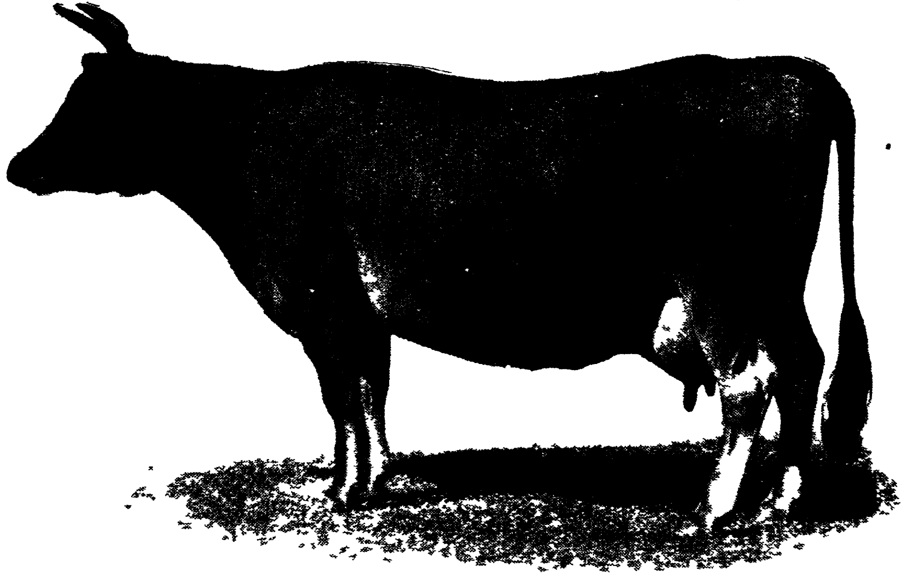

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[Stationed at Hawkesbury Agricultural College]

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E. HARRIS,
Wheat Commissioner and
Manager, Govt. Grain Elevators.

Of the three samples of wool forwarded one (No. 405) was sound, the others being slightly tender. In each a slight but gradual fining of the fibre took place.

GROUP II (Oaten Hay and Maize).

The average loss in this group was 23 lb. per sheep, or 30 per cent. The weights recorded showed a gradual decline during the first two months, a slight recovery during the following two, and then a gradual decline until the end of the experiment, checked on two occasions for a month and then continuing again. In spite of the loss of weight, a considerable amount of roughage was refused, the heads being taken and straw left, but all the maize was consumed. The hay ration was reduced to 1.5 lb. on 14th June; by August the condition was still fair, and a roughage ingestion check taken suggested the need for further reduction of the ration. During September the refusal of roughage was more pronounced, though the group was still losing weight, and lacked their earlier robustness and energy. The skins were, however, still healthy. By the end of October two sheep were showing anaemic skins, but otherwise all looked well. The ration was further reduced on 4th November to 1 lb., as only 50 per cent. was being ingested. The shearing on 23rd November effected a slight visible improvement. During the final four months all the ration was ingested, but the loss of weight continued, and, though by December two sheep looked poor, all survived to the full twelve months. On 2nd April, 1930, two could be described as forward stores and three as fair.

Although the total loss of this group was 23 lb. per sheep, the sheep were active and in fairly strong condition throughout the trial, and at no time did they show the emaciated appearance seen in some of the other groups.

Of the five samples, four fleeces were quite sound and one (No. 407) was tender. One showed no change in quality, the remainder showing a gradual fining of fibre. The growth of wool during the trial was healthy, and much superior in character to that grown prior to the start of the trial.

GROUP III (Lucerne Hay Only).

For the first four months this group showed a gradual increase in weight, gaining up to 2.4 lb. and looking plump. In the following eight months a very gradual decline resulted; this was checked and then maintained during the last two months. The total loss was 8.85 lb. per sheep, or 10 per cent., and at no time did this group show anything but good condition.

Upland lucerne, rather stalky and course, and containing some grass, and river flat lucerne, much finer in stalk, were used alternately as available. Until 20th August there was almost no roughage left. In September and October there was a greater residue—sufficient to warrant a reduction of the ration—and this was accordingly reduced to 2.25 lb. From 5th November onwards the ration was completely ingested.

One death occurred in this group on 28th February, 1930—a sheep which had throughout been below the average weight Death was due to peritonitis following a rupture of the colon which was associated with the presence of worm nodules (*oesophagostomiasis*).

Of the five samples, three fleeces were sound, while two (Nos. 411 and 412) had a decided weakness at the start, while the subsequent growth was tender; four showed a slight fining of fibre. The samples carried a fair amount of condition.

GROUP IV (Lucerne and Maize).

The total loss in this group averaged 23 lb per sheep, or 25 per cent. There was a gradual decrease in weight during the first two months, which was recovered at the end of the fourth month. The cause of a drop of 12 lb. in August, evenly distributed through the group, is not apparent. After a slight recovery weight was maintained till the end of November, though examination on 23rd October revealed three anaemic skins. This group then appeared to be in better condition than any of the others. From 13th November to the end of the experiment there was a gradual decline, embracing a loss of 15 lb. through five months. At that date four were forward stores and one fair.

All concentrates were eaten throughout, and practically no roughage was left until September and October, when a slight voluntary refusal was met with a reduction of lucerne hay to 1.25 lb. per day. The appearance of the sheep warranted this reduction; subsequently there was no residue

Four of the five fleece samples were sound, the other one (No. 416) having a definite break at the start and tender later growth. Four samples showed a fining of fibre, one being very definite. The wool was light in condition, but not dry.

GROUP V (Maize Only).

This group showed a total loss of 17.8 lb. per sheep, equal to 23 per cent. There was a gradual decline, which was more marked in the earlier stages, due probably to the sudden change of food, not only of quantity, but of kind—there was an absolute absence of bulk. For the first six weeks the sheep did not consume the whole of the ration. Two marked divergencies from the general trend of the weights are due to the death of an under-weight sheep in the first instance, accentuated by the death of a heavy-weight sheep in the second instance. During the last five months, when presumably the sheep were well accustomed to the ration, the total loss was only 1.5 lb., and condition was well maintained. By 5th May the ration was being wholly consumed, but the sheep looked "tucked up" and unhappy. A gradual improvement was noticed in appearance after June, and in spite of the gradual loss of weight, by October their condition was fair. Shearing further improved them (the actual body weight increase from 13th November to 11th December—shearing being on 21st November—was 10 lb.), and weight and condition were then well maintained until the end of the experiment. This group was noticeably energetic and more difficult to yard than any except Group III.

TABLE I.—AVERAGE Weight at Monthly Intervals.

Group.	Weight at—													
	21 Mar., 1929.	27 April, 1929.	25 May, 1929.	25 June, 1929.	23 July, 1929.	20 Aug., 1929.	17 Sept., 1929.	23 Oct., 1929.	13 Nov., 1929.	11 Dec., 1929.	8 Jan., 1930.	5 Feb., 1930.	2 Mar., 1930.	2 April, 1930.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	80·4	77·75	76·5	76·3	76·7	72·3	68·2	64	63·6	58·6	58·3	57·3	56·3	54
2	76·4	74·2	73·6	73·8	74·2	70·9	68·2	65·2	60	60·2	59	57	58	58·4
3	82·1	80·6	83	83·6	85	80·8	79	78·2	75	74·2	75·2	71·4	73·25	73·75
4	91·8	89·2	88·2	90·2	91	79	83·4	82·8	83·4	76	75·2	72·2	70·6	68·2
5	78·8	76·25	74·75	72·25	76·7	73·3	72·3	70·6	62·5	64·5	64·5	61·5	63	61
6	80	77·4	70·8	70·8	69·4	68·75	66·75	63	61·75	55·5	55·25	53·25	53·5	50·5
7	82·8	81·2	77·8	73·6	72·4	67·8	65·3	62·7	61·4	58·4	56·4	53·8	53	50
8	82·6	81·6	78	78	77·4	72·4	70·5	71	70·6	65·8	63·6	63·4	61·4	58·8
								89						89

Three deaths occurred in this group—two in the early stages, April and June—and in both these cases there was a considerable quantity of sand in the abomasum and couch root in the rumen. In the latter case the immediate cause of death was the absorption of drench through a mucous membrane already weakened by sand erosion. A few aesopohagastomes were present in the bowel, but no stomach worms were noted.

One sample of wool (No. 425) was quite sound, and the other slightly tender. No. 425 had a bright, attractive growth, with generous condition. No. 421 showed a definite fining for nine months of the trial, with a bolder growth at the end.

GROUP VI (Oaten Straw and Linseed Nuts).

This group lost very heavily—to the extent of 9 lb. per sheep in the first two months—and from then onwards began a monotonously regular decline until the end of the experiment. The average total loss was 29.5 lb. per sheep, or 37 per cent.

As the amount of roughage not ingested was considerable, the ration was reduced on 14th June to 2 lb. of straw per head. Towards the end of June one sheep was injured in the shoulder, carrying the leg, and this obviously handicapped it and prevented its obtaining a fair share of the feed; death occurred on 19th August. By September the remainder were not showing droughty appearance, but by October two were showing anaemic skins, and the total loss of weight suggested that drought metabolism was commencing. A considerable quantity of straw was being left, and the ration was again cut down early in November to 1.5 lb.—half of the original amount. By this date the group was commencing to show a halting gait and a sunken and generally droughty appearance Emaciation was evident by January, and it was questionable whether they could be kept alive until the end of the experiment, should a cold snap occur; they were extremely weak. On

26th February ½ lb. lucerne hay was added to their ration, as their condition seemed critical. No improvement in weight resulted, but the sheep lost their dejected appearance. The ewe which died had ingested sand, much of which was retained in the abomasum and bowel.

Two samples of wool (Nos. 427 and 430) were sound and two slightly tender. All showed a slight fining, though No. 430 became bolder at the end. All samples showed good condition.

GROUP VII (Oaten Straw, Molasses, and Maize).

This group showed an even more significant weight decrease than Group VI. From beginning to end there was a steady loss of 3 lb. per sheep per month, the total loss averaging 33 lb., per sheep or 40 per cent. By 14th June the daily straw residue was considerable, and the ration was reduced 2 lb. At this early date two sheep were "tucked up," backs arched, gait halting, and they showed anaemic skins. Although still steadily losing weight and appearing more drought stricken, roughage was still being left on 23rd October, and a further reduction of the ration was made to 1 lb. per head. Even the addition of molasses to the straw apparently had not made it sufficiently palatable. By 21st November this group was very weak and emaciated, with sunken eyes. One ewe died on the 6th February, 1930, followed by another on 20th February. The ration was supplemented by 0.5 lb. lucerne hay on 26th February, and though this did not check the decrease in weight it evidently strengthened the ewes, and they appeared considerably brighter after only a few days feeding.

Post-mortems of the sheep that died revealed an extremely anaemic state and apparent absence of fat; apart from a slight lung congestion, no decided abnormality of the organs was apparent. There was no sand accumulation and no stomach worms; the food in the abomasum and omasum was quite soft and apparently well digested. In the case of the last ewe to die a few aesophagastomes were found in the abomasum and bowel.

All five samples of wool were slightly tender throughout, while four had a definite weakness about ½ inch from the base of the staple. All showed fining, one case being very definite. The samples had fair condition, but appeared light and lacking in body.

GROUP VIII (Lucerne Hay and Maize).

This group showed a gradual decline, checked here and there for intervals of one and two months, and in no case was the decrease in weight very rapid or marked. The average total loss was 23.8 lb., or 28 per cent. In this group one sheep was bullied, and did not fare so well as the other four, which by July were all looking well. This bullied ewe exhibited weakness throughout and an anaemic skin.

After the seventh month, that is, by 23rd October, the total loss was 11.6 lb. per sheep and the general appearance was still good. All the lucerne hay had been consumed to date, and because of the good condition of the animals, it was decided to reduce the maize ration to 7 oz. on 5th November. By the tenth month, the bullied sheep was slightly emaciated, and another was considered poor. During the last three months, condition was fairly well maintained, and at the termination of the trial two were forward stores, two fair, and one emaciated—it died soon after the termination of the experiment.

Three of the five wool samples showed a definite weakness about half-way through the trial, but were otherwise sound. One was tender throughout and one during the last half of the trial. Four samples showed a gradual fining, though two became broader towards the base of the staple.

Salt Ingestion.

Ingestion data in relation to the salt lick provided were only available for the periods 6th November, 1929, to 8th January, 1930, and 8th February to 2nd April, 1930. The amounts were very variable, and, read in conjunction with the body weights and general condition of the sheep, do not suggest any definite relationship beyond the fact that more lick was consumed in the last two months of the trial when most groups could be said to be definitely in the stage of drought metabolism.

Internal Parasitic Infestation.

Drought conditions are naturally inimical to stomach worm development, and the drenching precautions taken must be regarded only as measures essential to maintaining sheep on the College property. Worm infestation would so weaken the sheep as to minimise their resistance to drought conditions. Faeces from each group were examined at Glenfield early in the experiment (27th June), and showed a moderate infestation of *oesophagostoma, haemonchus contortus* and tristrongyles. This was after one month's freedom from drenching, which was carried out every twenty-eight days. Subsequent faecal examinations showed very few ova of these worms. In no case was *haemonchus contortus* found in the post mortem examination, of dead sheep. Post-mortem examinations lead to the belief that there was an increasing infestation of *oesophagotomes* with consequent nodules which apparently were not eliminated by the drench used for the stomach worms.

Faeces were removed at regular intervals to prevent fouling of the yards and fodder.

External Parasitic Infestation.

The ewes were dipped on 14th March prior to the commencement of the experiment. There was no sign throughout the trial of infestation by lice or tick, and only two sheep in Group VIII and one in Group VII were struck by fly. In each case the sheep were immediately attended to.

Rainfall.

There is no apparent relationship between the rainfall distribution and the performance of any of the groups. Exceptionally heavy rainfall in October, 1929, produced an extremely boggy condition in the pens, but no marked loss of weight resulted from it.

Temperature.

The temperature appears to have had very little relationship to the condition of the sheep. July, 1929, was the coldest month for thirty-four years at the College, yet four groups showed an increase in weight, two maintained weight, and only two (Groups VI and VII, which lost consistently throughout the twelve months) showed any decrease in that month. Similarly some groups maintained their weights throughout the extremes of heat in December and February. The sheep commenced the winter in good condition, and not already weakened by a lean summer beforehand

The Effect on the Wool.

The groups were shorn on 17th November, 1929. Unfortunately for the purposes of the experiment, the sheep were then carrying about fifteen months' wool, of which only eight months' growth was made under the drought-feeding conditions.

However, an examination of the wool made two months before shearing (that is, after six months of feeding) gave some indication of the growth made during that time. The length of staple varied between 2¼ and 3½ inches without any apparent relationship to the ration fed, but a dip stain which marked the growth at the commencement of the experiment, indicated that least growth had occurred in Groups I, VII and VIII, and most in Groups III and V.

The most striking features of the wool were the increased brightness of colour (at the commencement of the trial the wool was very dull and almost showed discolouration), and the marked development of character (very lacking before the trial), under the feeding conditions. The five ewes kept as checks exhibited, both before and during the trial, a slight discolouration and a very indefinite character

Samples of the fleeces were forwarded to the Sheep and Wool Expert for examination, and his remarks are incorporated in this report.

The two properties in which change was most expected, viz., spinning quality and soundness, verified in most cases these expectations. One sheep in each of five groups showed no change in spinning quality as a result of the feeding, but the remainder all showed a gradual fining off during the drought period—some quite definitely, others only slightly. In all groups there was a percentage of tender and/or distinct breaks. Of the fifteen definitely sound fleeces, fourteen showed only very slight or no fining in quality, and in the five cases, where a definite fining occurred, it was accompanied by unsoundness and/or a definite break.

It was possible to secure approximately 50 per cent. of the fleeces definitely sound after eight months' feeding, and possibly small alterations in the rations of the groups which produced the majority of sound fleeces, would eliminate completely this unsoundness.

TABLE II—EFFECT of Rations on Body Weight and Fleece Condition.

Group.	Ration Fed.				Average Total Digestible Nutrients. lb. per day	Average Nutritive Ratio.	Average Loss of Body Weight		Fleece.		
	26-3-29 to 14-6-29.	14-6-29 to 4-11-29	4-11-29 to 26-2-30	26-2-30 to 2-4-30.			Actual.	per cent.	Weight of 15 Months' Growth.	Soundness, 15 Months' Growth.	Soundness, 4 Months' Growth.
							lb.		lb.	Per cent.	Per cent
1	Oaten hay, 3 lb. ...	Oaten hay, 2 lb ...	Oaten hay, 1·5 lb.	Oaten hay, 1·5 lb.; Lucerne hay, ·5 lb.	·946	1:9·0	26·4	32	7·2	33	100
2	Oaten hay, 2 lb.; maize, 4 oz.	Oaten hay, 1·5 lb.; maize, 4 oz	Oaten hay, 1 lb.: maize, 4 oz.	Oaten hay, 1 lb.· maize 4 oz.	·84	1:9·5	23	30	8·2	80	100
3	Lucerne hay, 2·5 lb.	Lucerne hay, 2·5 lb	Lucerne hay, 2·25 lb.	Lucerne hay, 2·25 lb.	1·29	1:3·9	8·85	10	8·3	60	75
4	Lucerne hay, 1·5 lb.: maize, 4 oz.	Lucerne hay, 1·5 lb.; maize, 4 oz.	Lucerne hay, 1·25 lb.: maize, 4 oz.	Lucerne hay 1·25 lb., maize, 4 oz	·91	1:4·5	23·6	25	8·7	80	100
5	Maize, 12 oz. ...	Maize, 12 oz. ...	Maize, 12 oz. ...	Maize, 12 oz. ...	·6	1·10·4	17·8	23	8	50	100
6	Linseed nuts, 4 oz.; oaten straw, 3 lb.	Linseed nuts 4 oz.; oaten straw, 2 lb	Linseed nuts, 4 oz ; oaten straw, 1·5 lb.	Linseed nuts, 4 oz.; oaten straw, 1·5 lb.; lucerne hay, ·5 lb.	1·16	1:9·98	29·5	37	7·75	50	50
7	Maize, 4 oz.; oaten straw. 3 lb.; diluted molasses.	Maize, 4 oz.: oaten straw, 2 lb.; diluted molasses.	Maize, 4 oz ; oaten straw, 1 lb.; diluted molasses.	Maize, 4 oz.; straw 1 lb.; diluted molasses, lucerne hay, ·5 lb.	·81	1·24 5	32·8	40	6·9	All unsound	All unsound.
8	Lucerne hay, ·5 lb ; maize, 8 oz	Lucerne hay, ·5 lb ; maize, 8 oz.	Lucerne hay ·5 lb.; maize, 7 oz.	Lucerne hay, ·5 lb.; maize 7 oz.	·64	1·9 24	23·8	28	8·5	All unsound.	50

Groups II and IV produced 80 per cent. sound fleeces, and groups VII and VIII produced 100 per cent. fleeces defective in this respect, in greater or less degree. The other four groups yielded sound, tender, and definitely weak fleeces in irregular proportions. All the check sheep yielded sound fleeces, lacking in character, and somewhat discoloured.

A further examination of the new growth of wool from 13th November to 2nd April, *i.e.*, approximately 4½ months' growth, revealed a general improvement in tensile strength, twenty-two of the thirty fleeces examined being sound. Groups VI and VII, however, showed no better growth, the majority of the fleeces still being tender.

A comparison of the fleece weights with the body weight losses to the time of shearing shows that wool weight was not obtained at the expense of body weight; rather the two coincided—greater loss of body weight with lighter fleece production.

(*To be continued*).

Selected Citrus Buds.

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F. Ferguson and Son ...	2,000	3.000	...	...	...	5 000
A. T. Eyles	3,000	2,000	...	...	...	5,000
R. Hughes	500	500	250	500	1,000	2,750

—C. G. SAVAGE, Director of Fruit Culture.

The Manufacture of Sweetened Condensed Milk.

A. M. BROWN, Special Dairy Instructor.*

CONDENSED milk is cow's milk from which a considerable portion of the water has been evaporated, and to which sugar may or may not have been added. The investment of large amounts of capital is involved in building the condenseries and installing the machinery necessary for carrying on the production of condensed milk. Fixed expenses are comparatively heavy, and do not change to a great extent with the decrease and increase of the milk supply, which facts emphasise the importance of locating the factory in a district most suitable for economic manufacture. Three most important factors to be considered in this connection are milk supply, water supply, and cheap fuel.

A large supply of milk with possibilities for extension of this supply is necessary. Desirable localities for the establishment of condenseries are where the farmers have reasonably large herds and are used to taking care of the milk and to sending it to the factory daily. A good water supply, both as regards quantity and quality, is essential. Large amounts are necessary for washing purposes and boilers, for condensing, and for cooling the product. It has been estimated that the condensing of 1 lb. fresh milk requires about 3 gallons of water. The water supply must be pure, as it may come in contact with the milk. Even though all apparatus connected with the process may be thoroughly cleaned, there are other means whereby the milk may become contaminated by bad water. The water should be cool, and the cooler it is the more satisfactory will be the operation of the vacuum pan. The process of condensing becomes more difficult when the temperature of the water rises above 65 deg. Fahr.

Other conditions, such as easy transport facilities and the satisfactory disposal of the sewerage matter, should also be taken into account in establishing condenseries. Generally satisfactory lay-out and construction of premises to enable the most economical working of the plant are essential.

Pre-heating the Milk.

The first process in manufacture is to heat the milk to nearly boiling point, chiefly for the purpose of destroying bacteria, yeasts, and moulds, to help the solution of the sugar, and to prevent the milk from burning on to the surface of the vacuum pan. Usually temperatures of from 180 to 200 deg. Fahr. are used for this purpose. This pre-heating is accomplished in a number of different ways. Jacketted copper kettles are used in which the milk is kept in motion, and the heating done by steam with pressure which is directed into the jackets. Continuous pasteurisers with hot water or steam as the heating medium are also employed to pre-heat, and in some factories the milk is run through a "flash" pasteuriser and heated to a temperature slightly lower than what is required, and heating then completed in jacketted kettles.

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* In the preparation of this article reference was made to "Condensed Milk and Milk Powder," by O. F. Hunziker.

Adding the Sugar.

Sugar is added to the heated milk before the latter goes into the vacuum pan. The percentage of sugar varies, according to the requirements of the market, from 12 to 18 lb. per 100 lb. of milk, but generally about 16 lb. is used. Sometimes a separate tank is provided for the mixing of the sugar with the milk, and the whole is stirred by means of a mechanical stirrer. In other cases the sugar is dissolved with boiling water and the syrup is drawn into the vacuum pan together with the hot milk.

Condensing.

The sweetened milk is drawn into what is known as a vacuum pan where it is condensed under reduced pressure. This pan is connected with a vacuum pump.

The Vacuum Pan.—The pans are mostly constructed of copper, and are of various styles and sizes, different advantages being claimed for each. The pan consists of four main parts, namely, the jacket, the body, the dome. and the condenser.

The *jacket* forms the bottom of the pan · the inside wall is copper and the outside cast-iron. It has two steam inlets and one outlet, there is an opening in the centre of the bottom to allow the discharge of the condensed milk, and it is fitted with a contrivance to enable the milk to be sampled.

The *body* represents the main part of the pan. It is in the form of a cylinder containing copper coils with outlets through the jacket, the coils being connected at the upper ends with the main steam line. The milk enters the pan through the walls of the body by means of a pipe connected with the vat containing the pre heated milk, and the inflow is controlled by a valve outside the pan. It is necessary that this pipe be turned downwards inside the pan to direct the inflow of milk in the most suitable direction.

The *dome* is on top of the body of the pan and is fitted with a manhole, manhole cover, thermometer, vacuum gauge, sight glasses, lights and blowdown valve or vacuum breaker. The boiling milk in the pan can be watched by the operator through the sight glass on the manhole cover. The temperature of the milk or vapours is ascertained with the thermometer, that of the former by use of a longer type of instrument and that of the latter by a shorter type. The vacuum gauge connects with the interior of the pan and gives an idea of the number of inches of vacuum. Two sight glasses are provided in the back of the dome, and through these the interior of the pan is illuminated by lamps, gas, or electric light.

The blow-down valve admits air into the pan when necessary, in order that the finished condensed milk can be easily drawn off, and it also serves

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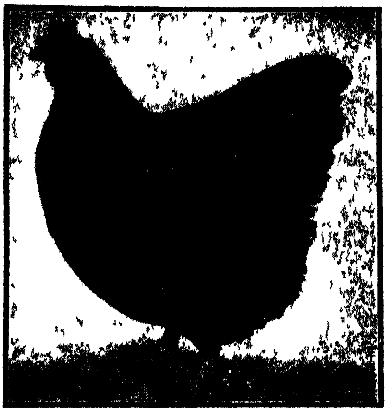

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to prevent the contents of the pan from being drawn over into the condenser when the milk rises above a safe level. An automatic sampler may also be an accessory of the dome. The sampler tube is carried through the wall of the dome to near the bottom of the pan. Certain equipment connected with this tube allows the operator to observe through a sight glass the position of the hydrometer, which indicates the density of the milk.

The *condenser*, as the name indicates, is that portion of the apparatus in which the vapours rising from the boiling milk are condensed, and it is attached to the dome. Condensers are of three types.

What is known as an expansion tank is frequently installed between the dome of the pan and the condenser for the purpose of collecting and reclaiming milk that may be carried over from the pan and to prevent its escape and loss through the condenser.

The Vacuum Pump.—A vacuum pump is necessary to ensure the efficiency of the vacuum apparatus, and its construction, workmanship, installation, and operations should be such as to give the maximum amount of efficiency. The suction end of this pump is connected with the end of the condenser farthest from the pan, and its action is to exhaust the pan, forming a partial vacuum. The pump should be placed on a good foundation as near the pan as practicable. The essential features of successful condensing of milk by evaporating under reduced pressure or in vacuo are economy and rapidity of evaporation, low temperature, and large capacity of apparatus.

Starting the Pan.

Before drawing the milk into the pan, the pan should be thoroughly rinsed with water, and then steamed until the temperature rises to about 180 degrees Fahrenheit or higher. The manhole cover is then put in place, all the air valves are closed, water is turned into the condenser, and the vacuum pump is started. When the vacuum gauge shows over 20 inches of vacuum, the pan is ready for the milk.

Operating the Pan.

The valve of the milk pipe leading to the pan is now partly opened. The milk enters the pan automatically as the result of the reduced pressure in the pan. When the milk covers the jacket, steam is gradually turned into the jacket. As each coil becomes submerged in milk, that coil is charged with steam. At no time should steam be turned on the jacket and coils when they are not completely covered with milk, as such action would cause the milk to stick to and burn on the heating surface, the milk would assume a burnt flavour, it would become permeated with black specks and evaporation would be retarded. To commence with only a few pounds of steam pressure should be used in the jacket and coils, so as to avoid burning owing to the presence in the milk of considerable air. As the milk becomes more concentrated and settles down to uniform boiling, the steam pressure may be gradually increased until it reaches the maximum The maximum pressure permissible is governed by the amount of heating surface, the capacity of the vacuum pump, and the temperature and amount of water available for use in the condenser. Under average conditions about 15 lb. of steam pressure may be safely used.

During the early stages of the process, when the milk is of low density, the evaporative duty is high, probably about 25 to 35 lb. per square foot of heating surface with 10 lb. of steam pressure. This gradually decreases and is lowest toward the end of the process.

When enough milk is in the pan to cover the jacket and coils completely, the milk intake should be reduced and regulated in accordance with the rate of evaporation. The milk is drawn into the pan continuously, but only as fast as it evaporates. It should be kept as much as possible at a constant level, and this level is preferably as low as is consistent with complete covering of the upper coil.

In order to secure maximum rapidity of evaporation, the vacuum pump should run at the proper speed and its operation should be uniform, a uniform vacuum and temperature should be maintained, and the milk should be prevented from rising to an abnormally high level in the pan.

Prevention of Accidents.

The operator should pay strict attention to the pan in order to avoid loss of milk due to accidents. He should watch the water supply and govern its use accordingly. If the water supply becomes exhausted, air is liable to be drawn into the pan through the condenser. This will cause the milk to drop suddenly and then rise in a body, threatening to escape through the condenser. Whenever air in considerable quantities is allowed to enter the pan while in operation, whether as the result of lack of water or through any other cause, or when the vacuum pump is allowed to stop and live steam is turned into the milk in the pan, as is the case when the milk is superheated, the escape of milk may be avoided by immediately shutting the steam inlet to the jacket and coils, by closing the milk intake and by slightly opening the blow-down valve whenever the milk rises dangerously high. By skilful manipulation of the blow-down valve until the milk again settles down to uniform boiling, loss can be avoided and the process can be continued in the normal way.

By the time all the milk is in the pan, condensation is nearly completed, and from ten to twenty minutes further boiling usually gives the milk the desired density. Toward the end of the process the steam pressure in jacket and coils should be reduced to about 5 lb. or less. When the milk approaches the desired density, it is comparatively heavy and viscous and boils less vigorously. It is therefore more directly exposed to the heating surface. In the case of excessive steam pressure, its quality is jeopardised. If the batch is small so that the level of the milk drops below some of the coils, steam to the exposed coils should be turned off entirely.

Finishing the Batch.

When the boiling milk in the vacuum pan approaches the desired degree of concentration, the batch is "struck." The term "striking" is applied to the operation of sampling the condensed milk and testing the sample for density. To know just when the proper concentration has been reached is difficult and requires practice and patience. Besides the various indications which remind the operator that the process is nearly completed, there are also a number of mechanical devices and methods used for a similar purpose or in conjunction with the former.

Drawing Off the Condensed Milk.

As soon as the evaporation is completed, the steam is shut off from the jacket and coils, the water valve is closed, the vacuum pump stopped, and the vacuum broken by opening the "blow-down" valve. The manhole cover is then removed and the vacuum pump started again in order to remove the hot air over the milk. The condensed milk should be drawn from the pan into cans or into tanks or cooling vats as rapidly as possible to prevent its superheating while in the pan. In some factories a wire mesh or cloth strainer is attached to the outlet of the pan, so that the condensed milk is strained before it runs into the cans. This practice is unnecessary and objectionable, as it tends to retard the removal of the milk from the pan.

Cooling.

The sweetened condensed milk as it comes from the vacuum pan has a temperature of about 115 to 130 deg. Fahr. It is necessary that it should be cooled immediately to prevent certain defects. The cooling is done in a number of ways. The finished product is then filled into tin containers by the aid of machinery.

Manufacture of Unsweetened Condensed Milk.

In the manufacture of this type of product the normality, chemical purity, and sweetness of the original milk are even more important than in the case of sweetened condensed milk. In this connection it is emphasised that any condition or factor that increases to even the slightest degree the tendency of the casein content of the milk to curdle may cause the formation of a hard coagulum during sterilisation and make the manufacture of a marketable product difficult. It is obvious that the greatest care is necessary on the receiving platform in detecting suspicious milk and rejecting any that is not up to a satisfactory sanitary standard.

The original milk is pre-heated but in a somewhat different manner to when sweetened condensed milk is being made. The same apparatus (the vacuum pan and pump) is used, and the process of condensing is substantially the same as with sweetened condensed milk. The sampling and testing for density are more easily done than in the case of the sweetened article.

When 16 per cent. sugar has been added (in the case of sweetened condensed milk), about two and a half parts of fresh milk are reduced to one part of condensed milk. In unsweetened condensed milk the ratio is two to two and a half parts of fresh milk to one part condensed milk.

The Pecan Nut.

ITS HISTORY AND PROGRESS IN NEW SOUTH WALES.

C. G. SAVAGE, R.D.A., Director of Fruit Culture, and H. G. WHITE,
Superintendent, Viticultural Nursery, Narara.

THE Pecan (*Hicoria pecan* Britton; *Carya olivæformis* Nuttall) is a native of America, being found in great abundance in the basin of the lower Mississippi River and its tributaries, as well as along watercourses in Texas. The nut is highly esteemed as an article of food, and as it becomes better known will be largely sought after. The fruits of seedling trees vary greatly in size, the majority being small, while others are from medium to large, but many of the large-type nuts have been selected and named and these are being propagated and planted out under commercial conditions.

The natural habitat of the Pecan is along the river flats, but experience has shown that the trees can be successfully grown over a fairly wide range of soil and climatic conditions. The opinion was held that the tree did not require the usual orchard tillage, but plantations which are regularly worked and cultivated have given better results than those which have not been worked.

Botanical Description.*

Hicoria pecan belongs to the family *Juglandaceae*. The trees are deciduous; branches solid; leaves alternate, odd-pinnate, with five to seventeen short-stalked leaflets that are oblong lanceolate; monoecious. Staminate flowers are borne on pendulous three-branched catkins which may be solitary or fascicled in axils of the leaves on two-year-old wood, often at the side or base of new growth; calyx two- to three-lobed, stamens arranged in two or three series. The pistillate flowers are borne terminally on the current season's growth in two- to ten-flowered spikes, involucre four-lobed, enclosing a one-celled ovary. The fruit is globular to oblong, having a thick husk that usually separates into four valves (*see* Fig. 2).

The nuts are oblong (but in a few specimens round), with a shell varying from very thin and easily cracked, to thick and hard to crack, and range in size from 200 or more per lb. to some of the large cultivated varieties that require less than fifty to the lb. The kernel is divided into halves and, in many varieties, is of excellent flavour and quality.

The History of the Pecan in New South Wales.

So far as can be ascertained the Pecan was introduced into New South Wales about forty years ago; seedling trees of about this age are growing around Grafton on the North Coast of this State, perhaps the largest and best known of these being that growing on the property of J. H. Crespin, Esq. The height of the tree is calculated to be from 50 to 60 feet and the spread 40 feet. In 1923 the yield from this tree was 50 lb., in 1924 about 45 lb., and in the 1930 season 140 lb. of nuts which were sold at 10d. per lb. and gave a gross return of £5 16s. 8d. The average crop for the past five years has been 60 lb., equal to a gross return per annum of £2 10s.

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* Many of the details given in the opening passages and under this heading have been based upon information obtained from "Pecan Growing in Florida," by G. H. Blackmon.

At the State Forest Nursery, Gosford, there are several seedling trees thirty years old, some of which have borne very fair crops for several years past. Two of these trees have developed stems having a diameter of 15 inches at a height of 3 feet above the soil level, their height is approximately 45 feet, and the spread of the branches 30 feet, while three others have a diameter of 12 inches, are 25 feet high, and the spread of their branches is 20 feet. These measurements are of considerable importance when it is considered that, in addition to the value of the nuts borne, the trees have a commercial value on account of the timber, which is used for the same purposes as hickory. One of these trees is producing a fair-sized nut of high quality (*see* Fig. 4). The trees commenced to bear about ten years after planting and produced on an average 25 lb. of nuts per tree in 1930, which showed a gross return of £1 0s. 10d. per tree at 10d. per lb.

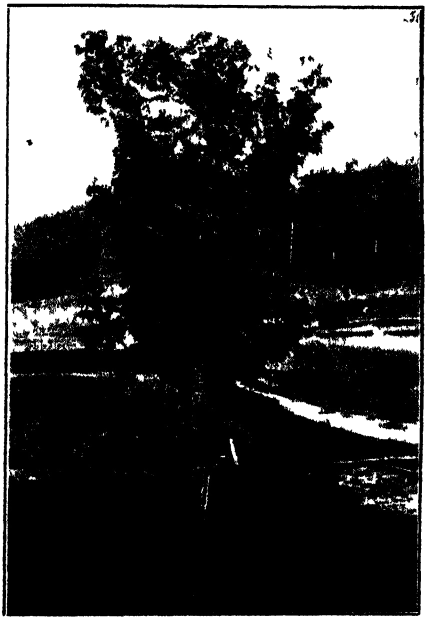

Fig. 1.—A Stuart Pecan Tree on Seedling Stock.

This tree was patch budded in 1923, and planted in its present position in 1924; the photograph was taken in January, 1930.

Departmental Plantings.

During the winter of 1915 this Department planted out seeding trees at the Narara Viticultural Nursery, and the following year worked trees of named varieties, together with seedlings raised from named varieties were added to the plantation, which at the present time contains some three hundred trees.

The seedling trees were somewhat slow in coming into bearing, the first fruits being gathered in 1929. The worked trees were much quicker in reaching the productive stage, fruit being harvested when the trees reached six years of age. The nuts from the seedling trees have for the most part been small (*see* Fig. 4) and not comparable with those of the named varieties. The heaviest yield yet recorded from any of these trees has been 5 lb.

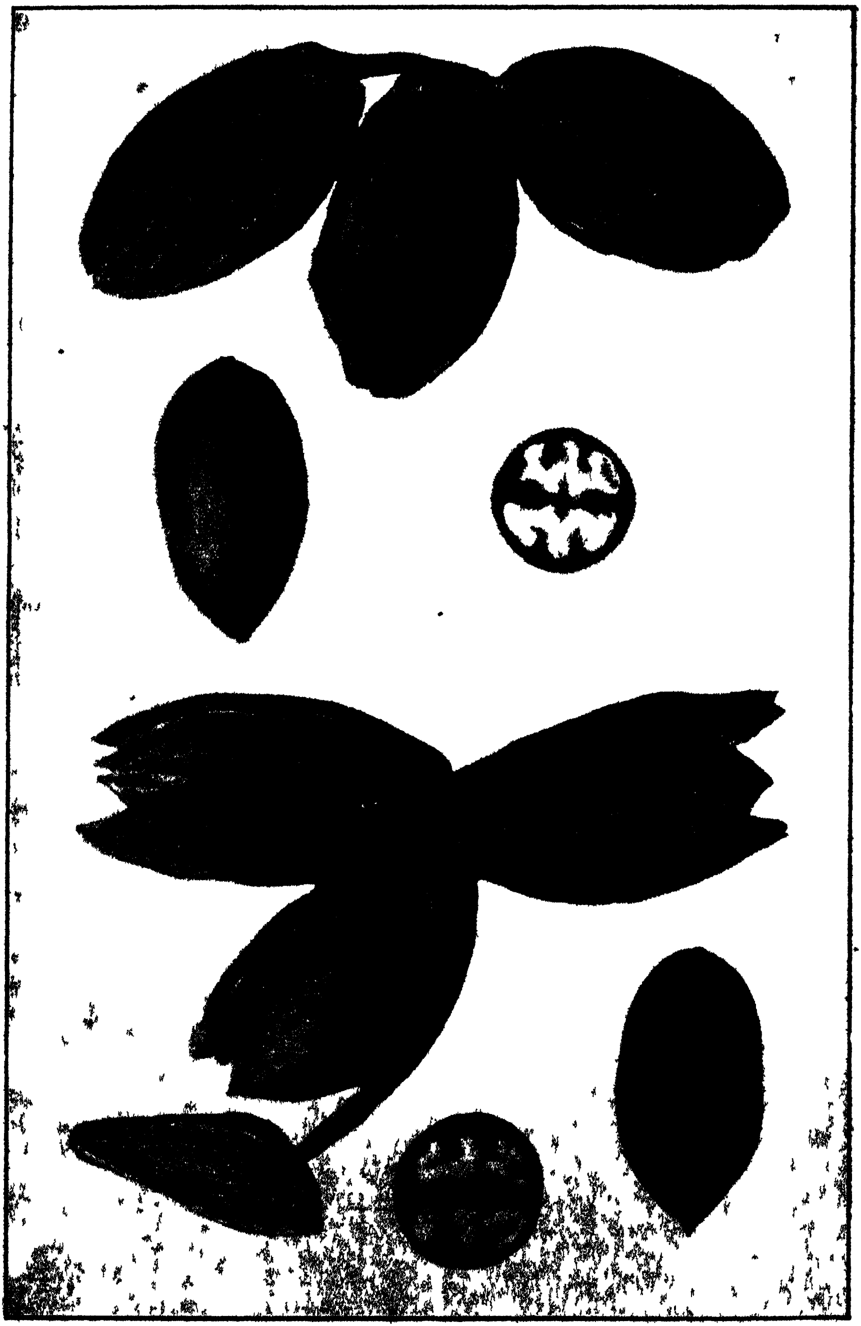

Fig. 2.—Fruits of Pecan Varieties.

Top.—Van Dieman variety, showing cluster of fruit, nut, and cross section of kernel (natural size).
Lower.—Pabst variety, showing cluster of fruit with the husk divided into quarters, nut, and cross section of kernel (natural size)

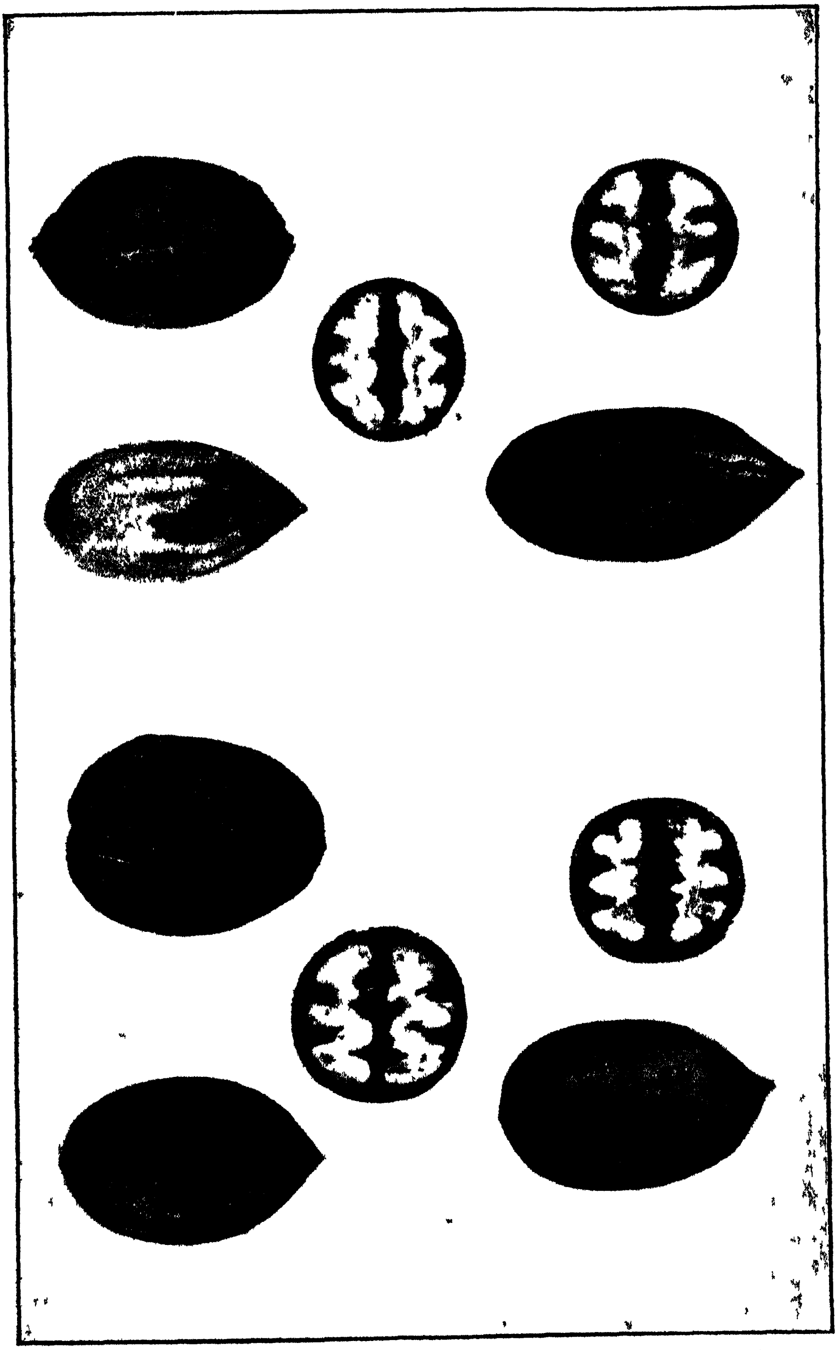

Fig. 3.—Nuts of Other Pecan Varieties, showing cross sections of kernels (natural size).
Top left.—Stuart. *Top right.*—Schley. *Lower left.*—Success. *Lower right.*—Frother.

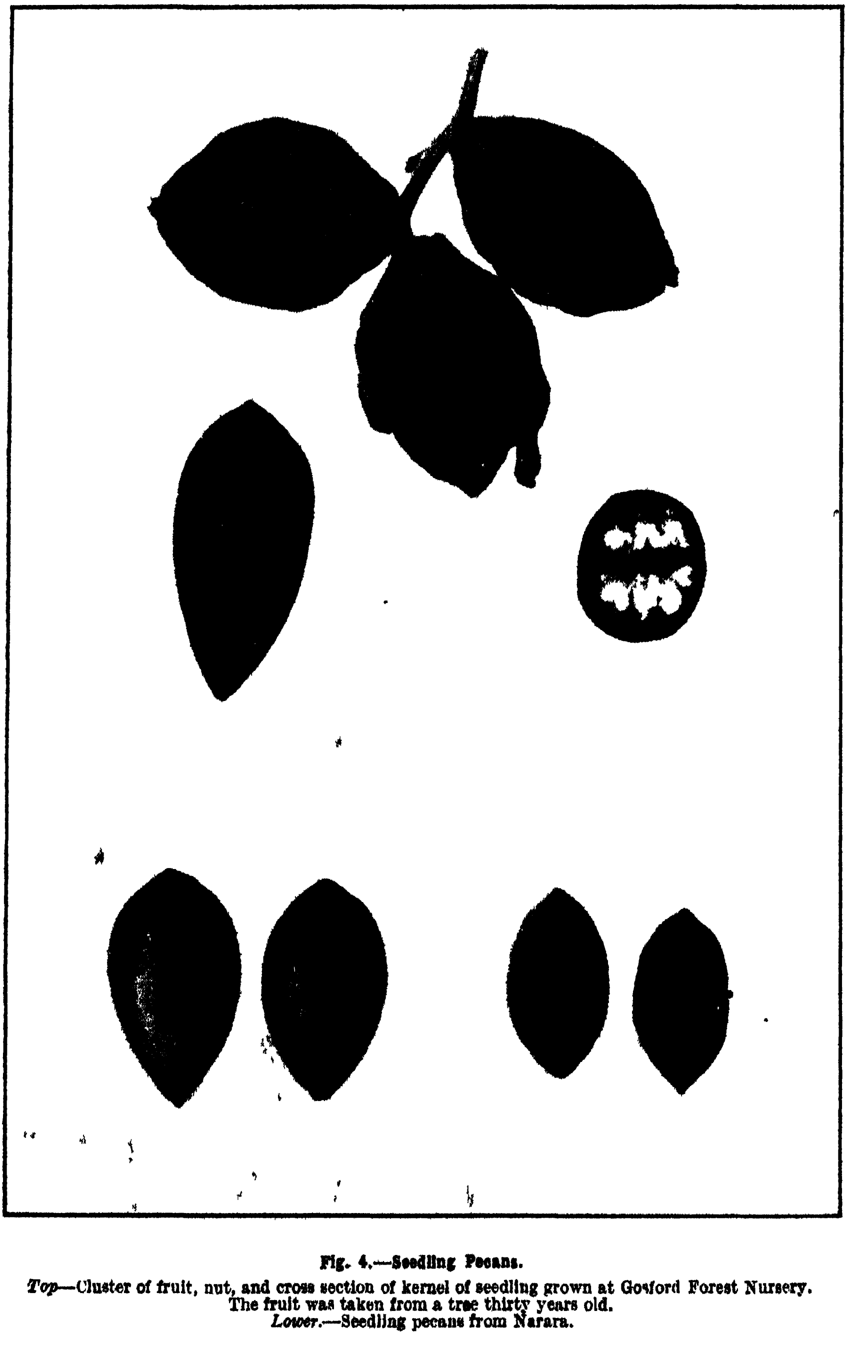

Fig. 4.—Seedling Pecans.

Top—Cluster of fruit, nut, and cross section of kernel of seedling grown at Gosford Forest Nursery. The fruit was taken from a tree thirty years old.
Lower.—Seedling pecans from Narara.

Seedling and grafted trees have also been planted out in orchards at the experiment farms at Grafton and Wollongbar on the North Coast, Hawkesbury Agricultural College (Richmond), Bathurst Experiment Farm, Riverina Welfare Farm (Yanco), and with several private growers throughout the State.

The trees at the Grafton Farm commenced to bear at six years old (1930), when small lots of fruits were gathered from both worked and seedling trees; the results from these trees should give valuable data as to the suitability of the nut for the Grafton district. The trees are now 10 feet to 12 feet high and have a spread of 6 feet to 8 feet. The Grafton trees are in a cultivated orchard whereas those at Narara are growing in grass land. This may account for the earlier cropping in the former orchard, but at the same time the difference of climate cannot be overlooked—the Grafton climate approaches nearer to semi-tropical conditions than does that of Gosford.

Although the trees at Wollongbar are the same age as those at Grafton, they have not made the same vigorous growth nor have they commenced to produce fruit. The reason for this is probably the fact that the plantation is more exposed than the Grafton orchard, the trees being at times during the tropical storms almost stripped of their leaves during the growing period. Trees are growing both in cultivated and grass land at this orchard, and it is interesting to note that those under cultivation are growing more strongly than those under grass

The trees at the Hawkesbury Agricultural College are from four to six years old. The older trees are just commencing to produce fruit, and the majority of the trees have made satisfactory progress. The trees at Bathurst, Yanco and with private growers are from one to three years old, and are consequently too young to produce fruit.

Propagation of the Pecan.

Stocks are usually raised from seeds and are grafted or budded in the nursery rows. The most successful method of propagating the trees at the Narara Nursery, where all the nursery work up to the present has been carried out, has been by whip and tongue grafting during the late winter or early spring, and the patch and annular or ring budding during the summer months have also been fairly successful Whichever method is followed, great care must be exercised to see that the graft or bud is securely and firmly tied.

Careful Lifting from the Nursery is Necessary.

Because of the long tap root care must be taken in lifting the trees—in order to ensure that the root system will not be excessively damaged. It is necessary to dig the trees by hand, and the roots should be covered immediately with soil in order to prevent them drying out before packing. When packed the roots should be embedded in damp material such as straw or sawdust so that they will arrive at their destination in good condition.

Planting Out.

The trees may be planted either as a windbreak or in orchard blocks. The distance that they should be set apart will vary according to soil conditions, and may be from 30 to 50 and even up to 75 feet. The plantation may be set out on either the square, rectangular or hexagonal systems; the square system is usually preferred, being much simpler to lay-out, but a few more trees are planted per acre by the use of the hexagonal system.

The land should be prepared as for other orchard trees, and the planting carried out during the winter months while the trees are in the dormant stage.

The following statement gives the number of trees required to plant an acre of land on the square, rectangular and hexagonal systems:—

Square.		Rectangular		Hexagonal	
Feet	No trees	Feet	No. trees.	Feet	No trees
30	48	20 x 30	72	30	55
35	36	30 x 40	36	35	41
40	27	30 x 50	29	40	31
45	21	40 x 50	21	45	24
50	17	..	...	50	20

Pruning.

The trees require but little pruning, the annual operation, once the tree has been framed, consisting of thinning out over-dense growths and the removal of broken and dead shoots. The fact that the fruit is borne upon terminal shoots must not be lost sight of, as any drastic cutting back would tend to remove much of the fruiting wood and thereby considerably reduce the coming crop.

The trees should be framed with a head from 3 to 4 feet or even higher above the soil, and the branches encouraged to radiate out equidistant from each other around the trunk. It is well to prune back the main arms during the early years in order to force out secondary arms towards the base of the main arms and thus build a strong framework into the tree.

Harvesting the Nuts.

The fruit is usually allowed to fall from the trees to the ground. Just prior to harvesting in the autumn the soil should be cleaned of weeds to just beyond the spread of the limbs, and the surface brought into a fairly even condition. The majority of the fruit will fall readily, but that which remains may be dislodged by lightly jarring the limbs. The nuts are either gathered by hand or are raked into heaps and are then separated from the leaves and husks. After removal from the husks, the fruit should be exposed to the sun in order to ensure that the kernels are sufficiently dry to keep satisfactorily.

Prior to being sold the nuts should be passed over riddles and graded to size.

The Value of Potash as a Fertiliser for Citrus Trees.

RESULT OF AN EXPERIMENT AT NARARA.

R. J. BENTON, Special Fruit Instructor, and W. B. STOKES, Fruit Inspector.

AN experiment to test the value of potash as a fertiliser for citrus trees—and originally also to compare the muriate with the sulphate form—has been conducted since the year 1922 in co-operation with Mr. W. Holcombe, of Narara. A progress report was published in the July, 1925, issue of this *Gazette*, and the purpose of the present article is to bring the results up to date. The inability to secure supplies of muriate of potash subsequent to 1924 necessitated the use of the sulphate form on both manured plots from 1925 to date, that is, from 1925 on, plot A received sulphate of potash as plot C had done from the beginning, while plot B received no potash at all.

The following amounts of fertilisers per tree have been applied annually (in two applications) since 1922:—

Plot A.	*Plot B.*	*Plot C.*
5 lb. Bonedust.	5 lb. Bonedust.	5 lb. Bonedust.
5 lb. Superphosphate.	5 lb. Superphosphate.	5 lb. Superphosphate.
4 lb. Muriate (since 1925 sulphate) of potash.	(No Potash.)	4 lb. Sulphate of potash.

In 1925, sulphate of ammonia (4 lb. per tree) was applied to each tree in all plots, as it was apparent that more nitrogen was desirable. Since 1927 half the trees on all plots have received an additional 5 lb. sulphate of ammonia.

The trees are Valencia Late, now planted eighteen years; they are fairly regular in size, a slight increase being apparent in the trees at the lower end of the gentle slope. The soil is a rather dark-coloured sandy loam of a fairly deep character.

Seasonal conditions experienced during the test have been exceedingly erratic, and have interfered considerably with production. In the 1929 season scarcely an orange (main crop) was borne, though a crop of intermediate-ripening fruit was produced. Intermediate-ripening crops have been produced each season, and it was not possible to record these completely. The 1930 crop, however, was peculiarly free of such interference. The erratic seasons are typical of coastal conditions, and cause much production of an intermediate-ripening character.

In addition to variation of production, seasonal conditions interfered with the quantity and quality of the fruit produced by the amount of "black spot" infection present. Black spot was particularly in evidence in the 1927 and 1928 seasons. Though records of losses by this cause could not be kept owing to the windfalls occurring over protracted periods, the indications were that all plots suffered approximately to the same extent.

Generally, the quality of the fruit has been disappointing each season up to 1930, when a decidedly improved appearance was evident as a result, probably, of the better growing season experienced almost throughout that year.

The Plot Yields.

The following figures show the production from the centre row of each plot (fourteen trees) for the years 1924-1930:—

Year.	Yield	Average Cases per Tree.	Average Case Count.	Total Oranges.	Weight of Oranges.	Number of Oranges per lb.
			Plot A.			
	cases.				lb.	
1924 ...	25·2	1·8	......	......	......	......
1925 ...	31·12	2·22	182·5	5,743	1,605	3·58
1926 ...	29·74	2·12	245·8	7,604	1,529½	4·9
1927 ...	14·34	1·02	152·1	2,184	677¾	3·1
1928 ...		(Figures unavailable.)			1,636¾	......
1929 ...			(Crop failed.)			
1930 ...	60·9	4·35	162·46	9,894	3,058¾	3·2
			Plot B.			
1924 ...	17·36	1·24	......	......	......	......
1925 ...	19·1	1·36	192·3	4,059	974	3·89
1926 ...	19·14	1·37	268·5	6,120	1,089¼	5·6
1927 ...	9·14	·60	204·3	2,003	488	4·1
1928 ...		(Figures not available.)			1,382	......
1929 ...			(Crop failed.)			
1930 ...	49·83	3·56	221·1	11,018	2,545¾	4·3
			Plot C.			
1924 ...	19·22	1·37	......	......	......	......
1925 ...	37·24	2·66	186·3	7,556	1,958	3·6
1926 ...	30·75	2·2	244·7	8,368	1,706⅓	4·9
1927 ...	17·7	1·26	161·6	2,860	855	3·4
1928 ...		(Figures not available.)			1,866	......
1929 ...			(Crop failed.)			
1930 ...	70·25	5·01	169·5	11,908	3,431⅓	3·4

In 1928 the recording of the half of the plots to which increased amounts of sulphate of ammonia had been applied in 1927, was overlooked, and in 1929 the total crop failure prevented production figures being secured. The production of the half plot areas in 1930 was as follows, Trees Nos. 1 to 7 being those which received only 4 lb. sulphate of ammonia, and Trees Nos. 8 to 14 those which received 9 lb. sulphate of ammonia:—

YIELDS from sections of plots receiving Sulphate of Ammonia in Small and Large Amounts.

Plot 4.

Trees No. 1 to 7 averaged 763⁴⁄₇ oranges, weighing 232⅛ lb. = 3·28 oranges per lb.
„ 8 to 14 „ 649⁶⁄₇ „ „ 204¹³⁄₂₈ lb. = 3·17 „ „

Plot B.

Trees No. 1 to 7 averaged 878⁴⁄₇ oranges, weighing 189¹¹⁄₁₄ lb. = 4·63 oranges per lb.
„ 8 to 14 „ 695²⁄₇ „ „ 177¹⁷⁄₂₈ lb. = 3·91 „ „

Plot C.

Trees No. 1 to 7 averaged 929⁴⁄₇ oranges, weighing 274¹¹⁄₂₈ lb. = 3·38 oranges per lb.
„ 8 to 14 „ 771⁵⁄₇ „ „ 230¾ lb. = 3·34 „ „

The following total numbers of fruits were obtained from the centre row of the plots:—Plot A, 9,894; Plot B, 11,018; and Plot C, 11,908 oranges.

These yields indicate that though Plot B has received no potash since the experiment commenced (1922), the setting of fruit has not suffered. It has become most evident, however, that the size of fruit has been greatly reduced where potash is withheld. This is reflected in the number of packed cases of each plot, viz., Plot A, 60.9 bushels; Plot B, 49.83; Plot C, 70.25 bushels. Further testimony to the reduced size of fruit is that in Plot B (no potash), 2,622 oranges were of 270 or more size per bushel, whilst in plots A and C combined, only 482 oranges were as small. In other words, oranges 270 and more to the bushel size were recorded as follows:—Plot A, 1.5 per cent.; Plot B, 24 per cent.; Plot C, 2 per cent.

While potash has been responsible for marked increase in size of fruit, it is of interest to note that each half plot receiving an increased amount of nitrogen (Trees 8 to 14) also produced larger fruit than the Trees 1 to 7. This may be explained partly by the fact of a somewhat lighter crop on the sections receiving 9 lb. sulphate of ammonia, but in the case of the no-potash plot (B), the difference in size was most marked.

Variation in individual tree production does not appear prominently. Plots A, B, C produced an average of 706, 787, and 850 oranges respectively. The number of trees producing above this average was as follows:—Plot A six trees, Plot B eight trees, Plot C eight trees, while the number of trees bearing above the average number was eight in Plot A, six in Plot B, and six in Plot C.

Effect of Potash on Appearance.

To determine to what extent the appearance of the rind might be affected, records since 1925 have been kept of the number of oranges from each plot which were somewhat rough or coarse in skin appearance. Each year's record has been very regular in that the percentage of coarse-skinned fruits have been greatest in the plot receiving potash and least in the no-potash plot. The latest record (1930) is fairly typical, and is as follows:—

	Plot A.	Plot B	Plot C
Fine skin	9,623	10,936	11,601
Coarse skin	271	82	307

representing 2.74 per cent., .74 per cent., and 2.58 per cent. of coarse skins respectively in Plots A, B, and C. Whilst a certain amount of coarseness might appear to be due to potash application it is almost certain that coarseness is really related to the size of fruit. This is corroborated by the very small size of fruit generally recorded on Trees 1 to 7 in Plot B, which yielded no coarse-skinned fruit at all.

Effect of Potash on Sugar and Flavour.

Several samples of fruit were analysed by the Chief Chemist of the Department, and many more were used for tasting and the juice extracted, no difference in eating quality being discernible. The Chief Chemist, after analysis, reported as follows:—"As far as the percentage composition of the juice is concerned, there is nothing to indicate that the application of sulphate of potash has been of any benefit, but on the contrary the total sugars are definitely depressed and the non-sugars have been increased."

Summary.

The indications from this manurial experiment are that in the sandy loam soils at Gosford potash fertiliser is necessary to maintain good commercial packing sizes in oranges. A decreased size of fruit may be expected if potash is withheld for a period of three years.

The profit due to the use of potash in this soil over the eight years is worthy of note.

Based on a return of 4s. per bushel for Valencias, and allowing for selling fruit up to a size of 252 oranges per case, the no-potash plot yielded £59 16s. per acre, whilst the trees receiving fertiliser, including potash, returned £92 8s., thereby showing a difference of £32 12s. per acre, which would be reduced by about £3 4s. for potash. In other words, withholding potash from these trees resulted in a loss of £29 8s. per acre, as compared with trees receiving sulphate of potash and other fertiliser.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1931.

Murwillumbah (T. M. Kennedy) Nov. 25, 26

1932.

Dapto (E. G. Coghlan)	Jan.	8, 9	Taralga (W. N. Fitzgibbons)	Mar.	1, 2
Albion Park (H. H. Beattie)	,,	15 16	Mudgee (T. P Gallagher)	,,	1, 2, 3
Wollongong (V. Stumbles)	,,	21, 22, 23	Cooma (G. E. Metcalfe)	,,	2, 3
Kiama (G. Somerville)	,,	26, 27	Moss Vale (H. Richardson)	,,	3, 4, 5
Kangaroo Valley (L. W. Vance)	,,	19, 20	Gundagai (W. J. Sullivan)	,,	8, 9
St. Mary's (T. Green)	,,	30	Camden (G. V. Sidman)	,,	10, 11, 12
Berry (Geo. Gillam)	Feb.	5, 6	Goulburn (T. Higgins)	,,	10, 11, 12
Nowra (R. King)	,,	11, 12, 13	Bowral (E. Waine)	,,	11, 12
Milton (G. Prior)	,,	17, 18	Crookwell (A. G. McDonald)	,,	17, 18, 19
Bega (A. O. Manns)	,,	24, 25	Kempsey (E. E. Mitchell)	April	6, 7, 8
Newcastle (P. G. Legoe)	,,	24 to 27	Taree (C. A. Jackson)	,,	7, 8, 9
Robertson (W. G. Jenkin)	,,	26, 27	Wingham (C. H. Blenkin)	,,	13, 14
Campbelltown (R. A. Sidman)	,,	26, 27	Maclean (T. B. Notley)	,,	20, 21
Tumut (Milton Archer)	Mar.	1, 2	Casino (E. J. Pollock)	,,	27, 28, 29

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Orchard Notes.

NOVEMBER.

C. G. SAVAGE AND H. BROADFOOT.

Summer Training.

A GOOD frame is essential to a tree, and it is important that the growth should be evenly balanced. During the growing period, young trees or those which have been worked over during the last two or three years should be inspected at regular intervals, and growths which threaten to lead to one-sided development checked, or even removed if they tend to sap the vigour of strong growths which are required for balanced development of the tree.

Removal should not be overdone for two reasons: firstly, because the tree must not be too exposed to wind action, which, if too many shoots are removed, may break the remaining shoots; and secondly, because the leaf is the tree's laboratory in which raw food material is changed into organised food material, and if too many leafy growths are removed the tree may be more or less starved.

Tying may be necessary in the case of grafted or budded trees to prevent the growths being blown off. To prevent sapping of buds and grafts it may be desirable to remove growths that occur below them, but this must not be overdone, for such growths protect the buds and grafts. Upon the subject of after-care of buds and grafts, a free leaflet may be obtained from the Department.

Beware of Codling Moth.

Experience has shown that codling moth is usually more prevalent during dry springs and summers than during wet ones. It follows, therefore, that growers of pears and apples should, this season, be especially active in fighting this pest.

Cherry Tree Slug.

Spraying with lead arsenate to control this pest should be commenced before it becomes numerous, and should, if necessary, be repeated several times. Should the slug appear on the trees a few days before the fruit has reached the picking stage, the spraying should be delayed until harvesting is completed. A keen lookout for the pest, and prompt and thorough treatment are essential.

Control of *Polystictus versicolor*.

Mr. E. C. Whittaker, Fruit Inspector at Batlow, has pointed out that the re-working of apples and pears to more suitable varieties is complicated to some extent in some districts by the prevalence of *Polystictus versicolor*—a fungus which gains entrance, generally through the cambium layer where the limbs have been cut, and works downwards, killing the tissues of the tree.

The control measures practised at Batlow, based on the principle that "prevention is better than cure" may be summarised as follows:—

1. De-head the tree to be worked-over fairly high up, thus avoiding large cuts which take many years to heal over.

2. Leave as much lateral growth, &c., as possible below the graft, in order to provide leaf surface to carry on the essential functions of the tree until such time as the grafts themselves are large enough to carry on the work.

3. Use plenty of scions in order that the cut on the stock may be calloused over as quickly as possible. It may be necessary to cut back some of these scions later, once the callousing over process is completed.

A system which has much to commend it is the use on any fair-sized limb, say, from 2 inches in diameter upwards, of one strap-graft, supplemented by two or more bark-grafts. Any medium-sized cut treated in this manner should, under ordinary conditions, be completely healed over in the course of two or three seasons.

However, it sometimes happens that owing to the age, size or formation of the framework of a tree it is impossible to comply with all these preventive measures. This was the case in one orchard at Batlow (where during the past few years many hundreds of trees have been worked over to more profitable varieties), and when a considerable number of very old apples were worked over *Polystictus* became so bad that the grower was subsequently forced to uproot many of the trees—in some cases after the grafts had made several years' growth. Various control methods were tried with, at first, varying success, but during the past year or two a method has been evolved which seems to have checked the spread of the disease considerably.

The method used is as follows. The grafts are examined at regular intervals, and if any sign of *Polystictus* is present the affected bark is cut out well down into good sound tissue, and the underlying wood scraped absolutely clean of any sign of the fungus. The wound is then treated with Bordeaux paste, the dressing being renewed from time to time until the wound commences to callous over fairly well around the edges. The cut surface is then painted over with white lead, or tar, &c.

In addition to receiving this treatment the trees are sprayed at spur-burst with double-strength Bordeaux mixture, which seems to have a particularly good effect in stopping the disease from spreading to the new growth. To be effective these control measures need to be applied before the disease gets very bad, hence the necessity of regular inspection of the grafts, for once properly started the fungus spreads fairly rapidly, and once it has a good hold on a tree it will, in most cases, be found more economical to destroy the tree than go to the trouble and expense of treatment.

Black Spot of Pome Fruits.

Black spot was responsible for considerable loss to growers of pome fruit last season, and they will have read with interest the report of the five-year trials at Batlow in the September issue of the *Gazette*. They are reminded, however, that the recommendations included spraying with lime-sulphur (1 to 35) subsequent to the "calyx" application should conditions occur favourable to the development of a late outbreak of the disease.

This method of control, Mr. W. W. Cooke, Senior Fruit Instructor, has pointed out, has been adopted with conspicuous success by many orchardists, the lime-sulphur being commonly applied with the various "cover" sprays of lead arsenate, though in some instances, especially with pears, the lime-sulphur was applied separately at intervals approximating the applications of lead arsenate.

Some orchardists appear to be afraid that the application of lime-sulphur at this stage will damage the leaves, and while it is possible that when the spray is applied, without precautions being taken, some burning of the leaves and fruit may result, many orchardists do use this spray, either alone or combined with lead arsenate, without experiencing any damage.

The precautions that should be taken to avoid injury are:

1. If lead arsenate and lime-sulphur are to be combined, the lead arsenate should be added to the diluted lime-sulphur in the orchard, and spraying commenced at once.

2. Add a "spreader" to the mixture. This only increases the cost of the mixture slightly—from 9d. to 1s. per 100 gallons.

3. Avoid spraying between the hours of 11 a.m. and 3 p.m. if the day is an exceptionally hot one.

The "browning" of the leaves which sometimes occurs on apple and pear trees is considered by some orchardists to be caused by spraying with lime-sulphur, but the fact that the condition is shown by unsprayed trees proves this to be incorrect, and it is the opinion of the Biological Branch of the Department that the condition is due to adverse weather.

Strawberry Packing Regulations.

Instances have come under the notice of the Department where the public have been defrauded in connection with the purchase of strawberries. One glaring case reported was that of a purchaser who paid 1s. 3d. for a punnet of strawberries at a retail shop in the city, and afterwards discovered that the box contained only one layer of about a dozen fruit, the remaining space being filled with packing material.

In order to protect consumers and safeguard the interests of growers, a regulation has now been issued under the Plant Diseases Act, prohibiting the sale of strawberries in packages containing any foreign substance in excess of 3 per cent. of the capacity of the package. Breaches of the regulation are punishable by a substantial penalty.

Embargo on Red Scale Infested Fruit, &c.

The introduction of any plant or fruit infested with red scale (*Chrysomphalus aurantii*) into certain parts of the parishes of Stanbridge, Gorton, Wyangan, Tabbita, Bingar and Yenda, county of Cooper, is prohibited.

Information can be obtained from the fruit inspectors or officers of the Water Conservation and Irrigation Commission stationed at Griffith, Yenda or Leeton as to the exact area covered by the prohibition.

Sidelines for Banana Growers.

Mr. H. W. Eastwood, Fruit Instructor, Murwillumbah, draws attention to the possibility of augmenting the dwindling profits to be had from bananas by growing passion fruit, pineapples, papaws, and bush nuts, all of which can be planted this month. The land should be properly prepared prior to planting, as in many instances it is impossible to cultivate to any great extent afterwards.

Passion Fruit.—Passion fruit vines should be planted in rows 7 or 8 feet apart, and the vines 15 to 20 feet apart in the rows. Run the rows north and south if possible. When planting out discard all diseased vines, particularly those affected with woodiness or "bullet." This disease can be detected in the young plants by a puckering or curling of the new growth, a mottled appearance of the leaves, and by small, pale-yellow spots on the older leaves.

Seedlings from 6 to 12 inches high that have not commenced to run are preferable to those with runners. Set the plants directly under the trellis wires in holes sufficiently large to allow the roots to be spread out naturally before filling in with surface soil and tramping down firmly. If the weather is unfavourable it may be necessary to water and shade the plants until they become established.

Pineapples.- Pineapples are usually planted in double rows, the two rows forming the double row being 20 to 22 inches apart, while the double rows are 8 feet apart from centre to centre. The plants in the rows are usually 18 to 21 inches apart, and "staggered," *i.e.*, the plants in one row are opposite the spaces in the other.

Suckers are mostly used for propagating pineapples, although gill sprouts and "robbers" produce a better first crop, but may take twice as long to bear. Suckers should not be planted deeper than 2 or 3 inches, and care should be taken to prevent soil getting into the hearts of the plants.

Smooth-leaved Cayenne, Queen and Ripley Queen are the most suitable varieties.

The Papaw.—Planting the seed *in situ* is gaining in favour, as the papaw does not transplant readily. Space the plants from 6 feet by 6 feet to 8 feet by 8 feet apart, and have one male tree for every twelve to fifteen trees of other sexes. If growing this fruit for other than the local market, the solid-fleshed, small-piped, hardier types should be grown, even though this means sacrificing flavour.

The Bush Nut.—The culture of the bush nut is being given increasing attention and is likely to become a profitable industry. This nut takes a considerable time to bear, but if planted between the stools in banana plantations it will be approaching the bearing stage when the bananas are declining in production. The bush nut tree can stand light, but not heavy, frosts, and does best in rich, free, friable loams, scrub or bastard scrub country being very suitable.

Pot-grown seedlings present the least difficulty in transplanting, particularly if the pots are of paper, in which case the plants can be set out in position without even removing them from the pots. If the plants have been raised in open seed beds, water the beds liberally prior to lifting and divide the soil into sections by pushing a spade to full depth between the rows in both directions. Then lift out the plants separately with as much soil and as many rootlets as possible. Keep them wrapped in moist sacking as a protection against the sun and wind until planted.

Provided the seedlings are shaded, well protected from winds, and regularly watered if necessary, they seem to do well if planted out on the small side. Space the plants from 22 to 25 feet apart.

SUMMER SCHOOL FOR BEEKEEPERS.

THE annual summer school in apiculture will be held at Hawkesbury Agricultural College, Richmond, from 5th to 20th January next. The course is open to persons of either sex over the age of 16 years, and the instruction includes practical work, lectures, and demonstrations covering all the work necessary in apiaries.

The fee for the course is £3 10s., which includes board and lodging. Students proceeding to the school by rail will be able to travel at concession rates where the distance to and from Richmond is not less than 25 miles. Students travelling by any of the North Coast Steam Navigation Company's steamers will also be entitled to a reduction in the fare.

Applications for admission to this course must be forwarded so as to reach the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than 18th December next. A prospectus giving full particulars of the course can be had on application to the Department.

STUDENTS DESIROUS OF GAINING FARM AND STATION EXPERIENCE.

A NUMBER of students, who will have completed the Hawkesbury Agricultural College Diploma Course in Agriculture at the end of the year, desire to gain further practical experience on farms and stations. These lads, about 19 to 21 years of age, have obtained a thorough grounding in agriculture during the three years' course and can be recommended. Should any farmer or pastoralist desire to obtain the services of any of these lads he should communicate with the Principal, Hawkesbury Agricultural College, Richmond.

Also, during the midsummer vacation (17th December, 1931, to 27th January, 1932, inclusive) certain of the College students are anxious to gain practical experience on approved farms. These students are from about 17 to 20 years of age, and the Principal would be pleased to hear from any farmer or grazier who is able to place one or more of these students.

Poultry Notes.

NOVEMBER.

E. HADLINGTON, Poultry Expert.

Battery Brooders.

ONE of the main items of interest to the poultry industry at the present time is the battery brooder, and while the Department, owing to the financial situation, was not able to instal one of these brooders for the purpose of testing the system, the matter has not been overlooked, and close observations have been made on the leading farms where battery brooders are installed to note results under various methods of operation and with different types of brooders.

During my tour abroad I came in contact with a few users of battery brooders, but in the centres visited in America and England this system had not been adopted to the same extent as here. However, those who had had two or three seasons' experience with these brooders had come to the conclusion that the chickens could not be kept in the batteries for longer than three or four weeks with safety, and that after coming out of the batteries it was essential to run them through a satisfactorily heated stage for two or three weeks longer to secure the best results. Observations made in this country on a large number of farms where these brooders are being worked serve to confirm this conclusion, and one of the outstanding cases where the chickens have been reared this season through all stages without a check is that of one of our largest commercial poultry farms where provision is made for gradually "'hardening off" the chickens after leaving the batteries. In this case the chickens were kept for from three to four weeks in the battery brooders, and were then removed to another brooder house fitted with a hot water circulating system having battens over the pipes and a hover for the chicks to go under. From this stage the chickens passed through two other gradual weaning stages before being transferred to well-grassed colony runs.

In a number of cases cold brooders were used to accommodate the chicks after leaving the batteries at four weeks, but in most instances the chickens received a set-back after coming from the regular heat of the battery to the widely varying outside temperature, and many showed the effects of crowding. A couple of the more experienced breeders have met with reasonable success in using the cold brooders, but generally speaking this method of handling the chicks direct from the batteries could not be claimed to give the best results.

Others who have, during the past two seasons, reared chickens successfully after leaving the batteries have adopted a heated second stage, and then handled the chickens carefully, not exposing them too much to outside temperatures until they have learnt to roost. In this connection it only stands to reason that chickens which have been kept closely confined for three or four weeks at practically a constant temperature must be subsequently carefully handled if they are to be reared without a check.

Conditions of Chickens in Batteries.

One outstanding feature of the battery brooders where they are worked under reasonably good conditions is the uniformly good health and development of the chickens while they are in the batteries and also the low rate of mortality. There are, of course, cases where the chickens have not been reared satisfactorily, and fairly heavy losses have been experienced, but this is mostly where either the brooder itself has not been worked properly or the housing conditions have not been suitable. Again, in one or two instances disease has been responsible for heavy mortality, and it does not appear that battery brooders are entirely a safeguard against contagious diseases.

Points to Avoid.

Among the various types of batteries in use are some in which the compartments are too much enclosed and do not allow of sufficient light and ventilation. The idea that a darkened battery is necessary to prevent cannibalism appears to be disproved, and in my opinion this vice is largely due to several factors, namely, feeding a too concentrated ration, inadequate ventilation, overcrowding and insufficient feeding space, the latter causing the chickens to scramble over each other and pick at those which are feeding. For this reason, too, the less obstruction there is to prevent the chickens having free access to the feed troughs the better, nor should the means of access to the feeding troughs be such as to cause chafing of the chickens necks.

Room Space, Ventilation, and Light.

It is essential that the room in which the battery is to be worked should have ample space, not only to facilitate working but to allow of a good supply of air to the chickens, because it has to be borne in mind that such a large concentration of chickens demands a plentiful supply of oxygen to secure good results. In this connection the space between the battery and the roof or ceiling should not be too restricted, and it is highly desirable that the room should have a ceiling in which ventilators are fitted to take off foul air. Baffled ventilators should also be provided along the walls near the floor so as to ensure a free circulation of air without direct draughts. In addition, adjustable windows should be placed near the top of the walls on both sides to provide light without allowing the sun's rays to shine on the chickens. These may also be opened in the warm weather when there is no strong wind blowing. Sufficient windows are necessary to ensure an even distribution of light over all compartments, particularly on dull days. In several cases it has been observed that the chickens have made better growth on the side of the battery where the light is strongest, and for this reason it is preferable to build the brooder house so that one side faces east and the other west.

Feeding.

Many users of battery brooders still continue to use a highly concentrated ration during the period the chickens are in the batteries, and almost without exception some trouble is experienced with cannibalism, whereas on the other hand a few instances have been observed where a wider ration is fed and no trouble of this sort has occurred, development being quite equal to that obtained on the narrower rations. It would appear that a simple ration similar to that used for feeding chickens in other types of brooders, but with the addition of 1 to 2 per cent. cod liver oil, would be quite satisfactory. Concentrates consisting chiefly of milk powder and bonemeal should meet requirements during the brooder stage, and for that matter up till the birds are twelve weeks old. One factor which is apparently lost sight of is that during the battery stage the chicks are fed on an "all mash" ration and, therefore, if the same percentage of concentrates is used as for chickens which receive a proportion of grain in the ration, the former would be narrower than the latter.

Early Maturity.

A feature which has been observed among all the early-hatched battery-reared chickens is that they have reached maturity earlier than is desirable, and sooner than those reared under ordinary conditions. Whether this may be partly due to the ration fed or to the close confinement in practically a uniform temperature is a matter which requires further investigation, but this aspect should be carefully considered because it bodes no good for any farmer to have a large proportion of his pullets commencing to lay at a little over four months of age, particularly in the case of heavy breeds.

Several years' observation will be required to ascertain if the battery system has any detrimental effect on the physique of the flocks in cases where successive generations have been reared by this method. In the meantime battery users should closely watch the development of the chickens and note whether there is any tendency towards early maturity, because too early maturity results in loss of size and eventually leads to the laying of small eggs.

It has been noted that where the chickens are kept in the batteries for four weeks or longer there is a tendency towards abnormal comb development, particularly among leghorns, and this is one of the indications of early maturity. On this account it will probably be found that three weeks in the battery is more satisfactory than longer periods.

WITH the bulk of farmers in any country, the problem is how to bring home to them not so much the results of recent research, but the common facts upon which their calling is based—practical, scientific, and economic. This is the task of the educational service, and if the educational service is effective, very little need be done to ensure that it will pass on all the practicable results of recent research.—Sir A. D. HALL.

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1*st December,* 1931.

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VOL. XLII. PART 12. DECEMBER 1, 1931.

Agricultural Gazette of New South Wales.

Lucerne for Pasture in Wheat Districts.

L. JUDD, H.D.A., Manager, Temora Experiment Farm.*

THE unsatisfactory prices ruling for wheat and the somewhat discouraging outlook of the market for the immediate future has resulted in a greater measure of attention being given to mixed farming. With the changed outlook there has been a tendency to specialise in fat-lamb production, as it offers one of the most remunerative side-lines that can be conducted in conjunction with wheat-growing. As one of the cardinal points in fat-lamb production is the provision of an adequate supply of nutritious and fattening fodder, it naturally follows that greater attention must be given in the future to the cultivation of the "king of fodders"—lucerne. In fact, the changed outlook of wheat farmers, who now view their farm activities as "stock and wheat" in place of "wheat and stock" as in the past, demands that pasture improvement should occupy a foremost position in farm practices to-day.

The Potentialities of the Crop.

The cultivation of lucerne in the wheat areas has as yet been given scant attention, and the potentialities of this remarkable legume are only realised by a small minority of our wheat-farmers. This may be attributed to several causes, the most important of which is the general impression that lucerne will only thrive and prove a practical proposition when sown on the rich alluvial flats adjoining the rivers where the ground is heavily charged with organic matter, and where plant-food is in abundance, free water at a suitable depth, and climatic conditions assure a regular and adequate distribution of rainfall.

While admitting that the rich alluvial flats stand supreme for lucerne culture, particularly from a cutting point of view, there are thousands of acres of our ordinary wheat lands which could be profitably sown to lucerne. In fact, it may be definitely stated that with few exceptions, where wheat can be produced with an assured annual yield, lucerne can be profitably grown.

Another factor which has retarded the extension of lucerne has been the unsatisfactory experience of some farmers in an attempt to establish a stand. An investigation of numbers of these cases will reveal that the cause of failure may be directly attributed to the methods followed, rather than to unsuitable soil and climate. Again, numerous farmers have had the firm convictions that a seeding of anything less than 12 or 15 lb. would be useless. Conviction that a seeding of from 2 to 6 lb. per acre, according to conditions, will provide an excellent stand, invariably results in a totally different viewpoint, and a decision to place down an area at an early date.

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* Paper read at the 1931 State Conference of the Agricultural Bureau of New South Wales.

Briefly, some of the outstanding qualities of lucerne are:—

1. Lucerne is a noted drought-resister; it is a native of central Asia. Proof is not lacking in this State of the ability of the plant to weather most severe droughts. The general opinion that lucerne must have an assured and well distributed rainfall has long since been exploded.

2. Lucerne can be successfully cultivated on a diversity of soil types and under varying climatic conditions from the coast to the far west, including the Monaro and New England districts.

3. Although rather difficult to establish on account of the seed being small and requiring certain conditions for germination and early growth, once lucerne is established, a paddock will stand a remarkable amount of abuse, and then come away again with the first suitable rain.

4. Following drought, lucerne is the first plant to make growth and the first to provide fodder, *i.e.*, provided the break does not occur in the middle of a severe winter.

5. Summer rains, which under ordinary circumstances on the wheat farm are classed as a hindrance and useless, can be turned to profit per medium of lucerne.

6. Lucerne provides clean pasture, comparatively free of grass seed, for topping off lambs for market.

7. Lucerne cultivation materially enhances the carrying capacity of the property. Lucerne on average wheat country, and under average rainfall conditions will give three times the carrying capacity of natural pasture. Stocking of two and a half to three sheep per acre is common practice in the reasonably sure districts.

8. Lucerne provides an excellent rotation crop for the renovation of old and "wheat sick" cultivation paddocks, and is of value when sown on paddocks subject to severe erosion.

9. In combination with other pasture, lucerne enriches and balances the rations; it permits of fats being continually turned off the property, and provides a fodder of excellent medicinal qualities, particularly during dry periods when other green feed is practically unprocurable.

10. When not required for grazing, the lucerne stand may be cut and conserved as either hay or silage; it is one of the most valuable and convenient fodders to store. When stored as hay there is no loss whatsoever from vermin.

11. Lucerne paddocks also provide an excellent fire-break in summer.

As to the drought resistance of lucerne, ample evidence has been given at Temora Experiment Farm over the past ten years of the remarkable vitality and resistance shown by both very young and established stands. One paddock has been established for the past ten years, during which period it has been, if anything, overstocked, with a view of testing its resistance and longevity. Despite the treatment and the lean years experienced since its establishment, it is considered too good a stand to-day to plough up.

Sowings have been made each year for the past five years, and in no case has a failure been experienced, despite the dry and unsatisfactory conditions experienced in 1928-29 and 1929-30. By no means could the two years be called average years as regards rainfall for this district, yet in each an excellent germination was secured, early growth was satisfactory, and despite the heavy grazing ever since, the stands are excellent to-day. A feature worthy of note is that in 1929-30 it was possible to agist 1,100 sheep from another experiment farm, in addition to the flock on this property, and further, the drought reserve (of both hay and grain) was disposed of at remunerative prices. This was only made possible by the additional carrying capacity provided by the established stands of lucerne and the top-dressing of pasture.

Soil and Climate.

Excellent and productive stands of lucerne have been established on the coast, central and far west, and on the tablelands—clear evidence of the adaptability of the plant to climate.

As regards soil types, lucerne undoubtedly shows a preference for the rich alluvial flats, but it can be successfully cultivated on a very large range of soils, comprising the bulk of our wheat lands

In the wheat areas (eliminating the creek flats ideally suited for lucerne), a good medium to light loam with a friable clay subsoil will be found most suitable for growth of this legume. A considerable area at Temora Experiment Farm has been established on silty clay land hitherto classed as totally unsuitable for lucerne. In fact, portion of the area comprises scald clay land of very little use for cereal culture. Even on this land excellent results have been secured to date, but it remains to be seen whether the life of the stand will be materially shortened on this class of land.

Sowings have been made in the Temora district on the black self-mulching clays of the Bland, and even during the past two years satisfactory growth has been made on this type of soil. As regards the genuine clay pug land, I am dubious of success. The harshness of the ground would militate against a good germination, and grazing would be very severe There is one dominant factor in the selection of a site for lucerne, and that is, under no condition must a swampy situation be selected. To sow lucerne on a swampy or waterlogged situation is to court failure. Lucerne will not stand wet feet, *i.e.*, stagnant water. Water lying a few days will do no harm, but where water lies for a protracted period, particularly in summer scalding and death will result. Flood or running water may inundate a paddock for a week or more, and provided weather conditions are suitable little damage will result. It will thus be seen that the situation of the land is the primary consideration—and not the class of land.

The Establishment of a Stand.

The majority of failures with lucerne can be directly attributed to the faulty methods employed in the establishment of the stand. There are pitfalls which, if not avoided, will spell failure to your efforts to attain a good paddock of lucerne.

In the first case, the small seed of lucerne and the necessity for light covering make imperative a greater degree of compaction at the time of sowing than in the case of cereals. Sowings made on land lacking consolidation only succeed if ample rain falls to germinate the seed and develop the necessary compaction by means of saturation of the soil. Light rains sufficient to germinate the seed only, followed by prolonged dry weather, form a common source of failure, where the seed-bed has not been sufficiently compacted.

There is a prevalent opinion that soil should be ploughed deeply for lucerne; while the view is correct for the early stages of preparation of the coastal areas, it is invariably disastrous as far as the wheat areas are concerned. Preparation should be made along exactly the same lines as for wheat, with this exception, that in the final stages of preparation the mulch should be made finer and shallower, a greater measure of compaction being necessary for lucerne.

From experience to date, I favour well-prepared fallow land for lucerne seeding. Although lucerne will stand considerable abuse and droughty conditions when once established, it requires very great care in the early stages of growth. Further, being of slow growth in the early stages, it is often outstripped by vigorous-growing weeds when sown on dirty ground. These points, to my mind, warrant good cultural methods and the preparation of an excellent fallow for the establishment of the stand. I will admit that in numerous cases excellent stands have been established on stubble lands, but in numerous cases, it must be conceded, exceptional circumstances attended the planting and subsequent early growth. Generally speaking, results follow in a direct ratio to the thoroughness of preparation and seeding, and it can be safely stated that good fallowing methods are the best insurance for a good strike.

With reference to the practice of sowing a cover crop with lucerne, an experiment has been conducted for the past three seedings at Temora Experiment Farm. Both wheat and oats have been sown with lucerne at various rates of seeding. Each year has clearly shown the detrimental effect of the cover crop compared with straight-out seeding of lucerne. The stands take at least twelve months longer to provide their best grazing, and then, at their best, they make a poor contrast with the plots of lucerne sown alone. As a means of rapidly improving a big area of country in a rough way, in good districts the method has some redeeming features.

The Time of Sowing.

Autumn sowing is most generally favoured throughout the wheat areas, as under average conditions the plants have an opportunity of becoming well established before the heat of summer sets in. However, under certain circumstances autumn sowing is useless: land of a light nature and which is heavily infested with Cape weed should undoubtedly be sown in the spring, otherwise the chances of obtaining a successful stand are remote, enced [illegible]lly if a wet or drooping autumn is experienced. Cape weed seems to
plough up.

be a natural enemy of lucerne, and its vigorous growth in the early stages is in direct contrast to the slow early growth of lucerne, hence the possibility of choking out the young lucerne plants can readily be seen.

Avoid sowing dry, particularly on old cultivation paddocks heavily infested with weed growth; rather delay seeding and ensure the destruction of weeds. If dry conditions prevail till June, be content to make a spring sowing, as invariably the spring and early summer will be favourable.

If conditions are favourable, April is an excellent month for seeding. The warmth is in the ground to promote the most vigorous growth. For spring sowing, July in the early districts and August-September in the later districts, will be found to give best results

The Method of Sowing.

There are various methods of sowing, but for the average wheat farmer the drill will be found the most suitable and cheapest. Very satisfactory results have followed the use of the method employed at Temora Experiment Farm:—The tubes are removed from the drill and the gear forks regulated so that the machine is in gear with the hoes just out of, or touching, the ground. Drill harrows are attached for covering and the mixture of seed and superphosphate sown out of the fertiliser box. Provided the land has been well prepared, this method of seeding will result in an ideal covering of the seed. Certainly the light drill harrows may leave an occasional seed uncovered, but the majority will be covered to the requisite depth, *i.e.*, ½ inch. Excellent germination has been secured on every occasion at the Experiment Farm, and not one failure experienced

There is a distinct danger attached to deep seeding. In the first case, when dealing with land that sets badly, the chance of the seedlings pushing their way through the excessively thick covering is remote. Again germination is seriously delayed by deep sowing. It can be said with safety that more failures can be attributed to deep seeding than to any other cause.

Experiment data have shown a decrease in germination from 85 per cent. in the case of shallow sowing to 10 per cent. in the case of deep sowing, with the same seed and under the same conditions In view of this it can be readily appreciated why so many failures have been recorded in the past, when sowing was attempted on seed-beds lacking compaction and the seed buried as deep as 3 to 3½ inches.

Further trouble may be experienced with germination if the seed and superphosphate have been mixed together too long before seeding; damage can result any time after about thirty-six hours. The policy adopted at the Experiment Farm is to mix the same day as sown, and never to mix any quantity in advance.

Best results will follow the use of seed grown in this State. Never purchase imported strains—investigations have proved our local strains to be superior to the imported article. Co-operative purchase of requirements of seed through your branch of the Agricultural Bureau will be found to effect remarkable savings both in the individual purchase, and in the consigning costs. It forms one of the many avenues to reduce production costs.

Rate of seeding will vary according to your class of land and climatic conditions. Generally speaking, in areas similar to Trangie, good grazing stands may be obtained with a 2 lb. seeding. On the average loam in the typical wheat areas, 4 to 5 lb. will be found an excellent seeding. It has been the practice to seed at the rate of 6 lb. per acre at Temora Experiment Farm. The land being of a silty clayey nature makes satisfactory germination a difficult problem, and the 6 lb. seeding has been found to give best results under conditions existing there.

Manuring.

The quantity of superphosphate applied at the time of sowing will vary according to the district. As a general guide, 56 lb. may be used in the western areas and 84 lb. to 1 cwt. in the Riverina and South-western Slopes. For after-treatment, the same application as made at seeding may be applied every second year.

The After-treatment of a Stand.

The early treatment of the stand calls for careful attention. When the plants have reached 6 to 9 inches high, provided weather conditions are suitable, a feeding off should take place. This may be done with either big stock or sheep, but whichever is used the feeding must be rapid and of short duration. Put as many stock as possible (within reason on the paddock, and remove them when there is 2 inches of stalk left. By this means no damage will result to the crowns of the plants; excessive feeding off may permanently damage what otherwise would develop into an excellent stand. There are some growers who state that feeding down in the early stages ruins a stand, and that cutting should be resorted to. The practice of eating down has at all times been practised at Temora Experiment Farm, and the excellence of the stands leaves little doubt as to the wisdom and efficacy of the practice.

After the first grazing the plants are left till just appearing in flower and the paddock grazed down. If the number of stock is insufficient to cope with the feeding off, subdivision of the paddock should be resorted to to prevent waste. Weather permitting, grazing can be carried on for a month or more continuously. However, should heavy rain be experienced during the feeding down period, and new growth rapidly shoot away, the practice should be to stock very heavily for a short period in an attempt to eat as much of the old growth as possible, and then remove the stock till the new growth has attained the necessary maturity.

Four cardinal points must be observed to secure best results from grazing lucerne:

(1) Subdivision of paddocks, to ensure the size of paddock is in correct relation to the size of the farm flock.

(2) Never allow sheep to feed on lucerne when it is raining; both sheep and lucerne are liable to suffer.

(3) Never turn hungry sheep on lucerne, particularly if the growth be sappy.

(4) If sheep are grazed for any time on lucerne alone, a dry pick is essential for best results. Stock occasionally show symptoms of lucerne sickness when kept on the crop continuously.

The Renovation of Lucerne Stands.

It has been aptly stated that renovation is the life of lucerne, and growers are strongly advised to give at least one cultivation per year, and a top-dressing at least every second year. The cultivation is best carried out towards the end of July. The ground will invariably be found in good order at that period of the year, and a minimum of damage will result to the plants. Cultivation carried out when the ground is dry and harsh is liable to damage the stand; the selection of a suitable opportunity when the ground is moist will permit of easy entry of the tines, and ensure satisfactory work being done.

The cultivation results in a sweetening of the soil, permits of a measure of aeration taking place, and leaves the ground in a receptive condition to catch and absorb moisture which can later be put to excellent use.

For this cultivation the use of tickler points will be found to result in an excellent job, more particularly in the younger stands. Where it can be carried out and weather conditions are suitable, a summer cultivation often repays the cost incurred, particularly where the grazing has been heavy and the weather moist. It often happens that in a rainy summer there is far more feed on the lucerne paddocks than the stock can cope with. This presents an excellent opportunity to augment the fodder reserve. Such circumstances existed at Temora Farm during the past summer, and opportunity was taken to convert 150 tons of the lucerne into hay. To-day the neatly-thatched stacks at the Experiment Farm form a valuable reserve, and at the same time indicate the possibilities ahead of lucerne culture.

So successful has experiment and demonstration work been at Temora Experiment Farm that an area of over 300 acres is at present laid down to lucerne.

JAMES MURPHY BURSARIES TENABLE AT HAWKESBURY COLLEGE.

THESE bursaries, to be made available for the first time in 1932, have been provided from the income of the residuary estate of the late James Murphy, and are tenable by the sons of Roman Catholic parents whose means are, in the opinion of the trustees, insufficient to enable their sons to enter the Diploma in Agriculture Course at Hawkesbury Agricultural College, Richmond. Applications for these bursaries should be lodged with the Manager, Perpetual Trustee Co. Ltd., 33-39 Hunter-street, Sydney, before 15th January next. Applicants must be not less than sixteen years of age at the date of commencement of the first College session (about 27th January), and must hold the intermediate certificate or its equivalent.

Further particulars are obtainable from the Perpetual Trustee Co.

A Pasture Improvement Competition.

J. N. WHITTET, H.D.A., Agrostologist.

SIX entries were received for the above competition, which was conducted by the Kangaroo Valley Agricultural and Horticultural Association.

The following scale of points was used in judging the competition:—

SCALE OF POINTS.

	Points.
1. Palatability and feeding value of pasture plants present	20
2. Presence of clovers and other legumes	20
3. Freedom from weeds and other useless plants and disease	10
4. Management of pasture	10
5. Improvement effected in carrying capacity as compared with the unimproved area	40
Total	100

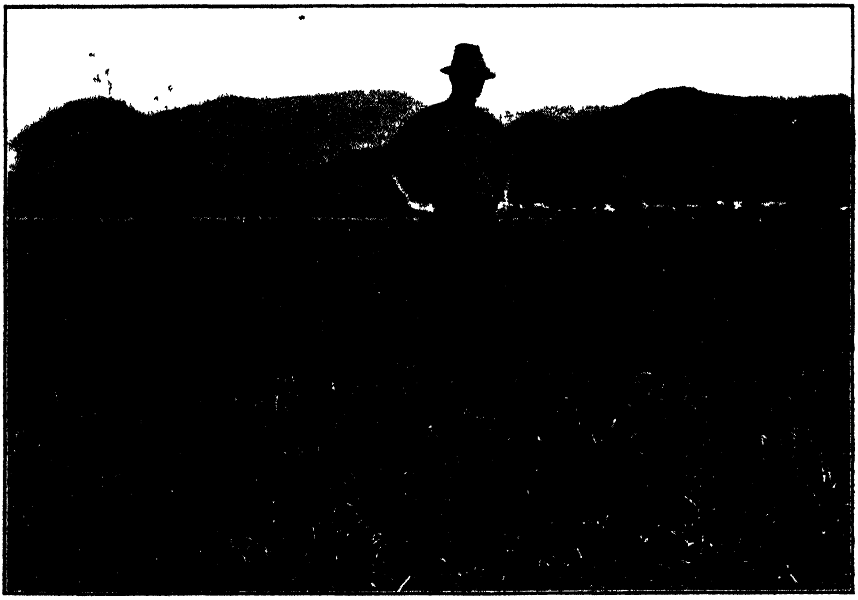
The awards are shown in the accompanying table:—

	Palatability and Feeding Value.	Legume Content of Pasture.	Freedom from Weeds.	Management of Pasture.	Improvement in Carrying Capacity.	Total.
(1) H. O. Cox, "Melrose," Kangaroo Valley.	16	16	9	8	33	82
(2) T. A. Cochrane, "Oakleigh," Barrengarry.	19	16	9	9	27	80
(3) P. Clempson, Glen Murray...	14	15	8	7	27	71
(4) James Chittick, Kangaroo Valley (Plot No. 1).	13	16	6	8	25	68
(5) H. A. Smart, Glen Murray...	13	12	6	7	28	66
(6) James Chittick, Kangaroo Valley (Plot No. 2).	12	15	5	8	25	65

The winning entry was on upland country, the main pasture plants present being Subterranean clover (*Trifolium subterraneum*) and Perennial Rye grass (*Lolium perenne*); some Paspalum (*Paspalum dilatatum*) and White clover (*Trifolium repens*) were also in evidence. Mr. Cox scored well for improvement effected in carrying capacity, the response of the clover and Rye grass to fertiliser being very marked. In March of this year the area received 1 cwt. superphosphate per acre, and in August last 60 lb. sulphate of ammonia per acre was applied. This competitor has proved beyond doubt the benefits to be derived from subdivision of paddocks, rotational grazing, and top-dressing of pastures to promote better quality pasturage for stock.

Mr. Cochrane's entry, which was placed second in the competition, was treated this year with 8 cwt. agricultural lime and 2 cwt. superphosphate per acre, and had been closed up a fortnight when the accompanying photograph was taken. This section of Oakleigh is of particular interest to growers of Perennial Rye grass and White clover, as it was sown sixty years ago with seed of these two species, and compares very favourably with some of the best New Zealand pastures of similar composition.

The paddock submitted by Mr. P. Clempson was planted three years ago with Perennial Rye grass and Perennial Red clover (*Trifolium pratense* var. *perenne*), and was top-dressed this year with 1 cwt. superphosphate per acre in the autumn and again in the early spring. During 1930, in addition to grazing the area at periodic intervals, four cuts of pasturage, consisting mainly of clover, were obtained, and averaged 30 cwt. of excellent quality hay per acre.



A Sixty-year-old Perrenial Rye grass—White Clover Pasture on Mr. Cochrane's farm.

On the upland soils of this district Subterranean clover is giving excellent results on country too dry for the production of a suitable stand of White clover. In many instances satisfactory establishment of Subterranean clover has been obtained by merely working the seed in amongst the natural pasturage with grass harrows. On the alluvial flats, however, Perennial Rye grass and White clover are the main pasture plants which should be established and maintained in a highly productive condition by adopting an intensive system of grassland management.

Home-made Wheatmeal.

CAN BE USED FOR BREADMAKING AND BREAKFAST FOOD.

G. W. NORRIS, Assistant Analyst, Chemists' Branch.

WHEAT can be ground in a hand mill into a meal suitable for use as breakfast food or for baking into bread, and a machine suitable for the purpose, and manufactured locally, can be obtained in Sydney for 27s. 6d.

The wheat should be thoroughly cleaned by sieving and hand picking, washed in hot water (comfortable to the hand), drained, and then spread out in a thin layer in the sun to dry; the grain should be turned over occasionally. When dry, the grain should be crushed several times, first lightly, and subsequently with the machine tightened up.

To Make Wheatmeal Bread.

The following quantities, under favourable conditions, produce a fair loaf:—

Meal	2 lb.
Yeast (compressed)	1 oz.
Sugar or honey	1 oz.
Salt	½ oz.
Water	1 pint.

A small piece of butter or lard can be added with advantage, and treacle or honey can be used instead of sugar, according to taste.

The method is as follows:—Dissolve the yeast and the sugar (or honey) with a little water (the water should be just warm, *not hot*). When doughed up, place aside in a warm place, well covered, for about thirty minutes; then rework and return to a warm place, covering as before for another thirty minutes. The dough should then be worked again, and pieces of about ¼ lb. in weight cut off and rolled quickly in a circular movement for a few seconds, and then placed into previously-greased and warm tins. When the dough is all tinned, cover and keep warm for another thirty minutes. It should now feel light to the touch, and there should be a noticeable increase in volume. This dough should be baked well, as it requires longer baking than white bread and a hot oven to give a brown finish

As this mill grinds coarsely, it is an advantage to add flour (as much as half and half) for bread-making. The quality of the bread depends upon the skill of the maker, as well as upon conveniences being available to carry out the work. It should be remembered that while this machine is capable of grinding wheat into meal, this product is quite different from that made on a commercial mill.

For Use as a Breakfast Food.

Take a sample of the meal and separate some of the flour with a fine sieve —about forty meshes per inch. The coarse portion makes an ideal breakfast food, especially if it is soaked overnight and given a long boiling next morning with a liberal addition of salt. The separated flour can be mixed back with the wholemeal.

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Stud pigs of **BERKSHIRE and TAMWORTH** breeds are available for sale at—

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Bathurst Experiment Farm, Bathurst.
Wagga Experiment Farm, Bomen.
New England Experiment Farm, Glen Innes.
Cowra Experiment Farm, Cowra.

Breeders are reminded that at the above institutions the studs have been augmented by importations of the best and latest strains available of Berkshire and Tamworth pigs from Great Britain.

Full particulars regarding prices, &c., can be obtained on application from the Principal, Hawkesbury Agricultural College, Richmond, or from the managers of the farms mentioned.

G. D. ROSS, Under Secretary, Box 36A, G.P.O., SYDNEY.

Cauliflower Experiments.

TRIALS AT WINDSOR, WELLINGTON, AND DUBBO.

J. DOUGLASS, H.D.A., H.D.D., Agricultural Instructor.

GROWERS co-operated with the Department last season in carrying out trials with cauliflowers at Windsor, Wellington, and Dubbo.

The Windsor Trials.

Both varieties and fertilisers were tested in the Windsor district during the past winter. In addition an experiment was carried out to ascertain the effect of fertilisers on the disease known as "whip-tail."

Plots on which the Fertiliser Trial was conducted.

Note 100 per cent. plants cut, with one row left for seed production.

In this district growers usually follow the cauliflower crop with early potatoes or an early summer crop such as rock melons. To keep up the supply of plant food under such heavy cropping, considerable quantities of artificial fertilisers are applied, the potatoes usually receiving a dressing of 6 cwt. of a complete fertiliser and the cauliflowers about 15 cwt. blood and bone.

Fertiliser Trial with Mr. John Gardener.

Previous experiments conducted by the Department have shown that 5 cwt. of a mixture of four parts superphosphate and one part sulphate of ammonia is ideal for cauliflowers grown in alluvial soil.

The object of the trial on Mr. Gardener's farm at Windsor was to ascertain if the proportion of sulphate of ammonia in the above mixture could with advantage be increased to one part to three parts superphosphate. In order to render the phosphoric acid content of this mixture available over a longer period, bonedust was substituted for half the superphosphate. The effect of potash on the yield of cauliflowers was again tested by dressing one plot with a mixture of four parts superphosphate, one part sulphate of ammonia, and one part sulphate of potash. Basic superphosphate was used on another plot. As past experience had shown the value of top-dressing with sulphate of ammonia when the plants were beginning to button, it was decided to gain further information on this point by top-dressing half of each plot with sulphate of ammonia at the rate of 1 cwt. per acre. This was done on 1st June, 1931, the plants having been put out in the field on 10th March, prior to which the fertiliser mixtures had

A Field of Cauliflowers showing 100 per cent. "Whip-tail" Infection.

been applied to the plots. Cutting commenced on 15th July and finished on 17th August, all plots cutting 100 per cent. marketable cauliflowers. The results are analysed in the following table:—

RESULTS of the Fertiliser Trial.

	Not Top-dressed.											**Top-dressed.**										
	1st Grade.			2nd Grade			3rd Grade.					1st Grade.			2nd Grade.			3rd Grade.				
	Number.	Value.		Number.	Value.		Number.	Value.		Total Value.		Number	Value.		Number	Value.		Number	Value.		Total Value.	
		s.	d.		s.	d.		s.	d.	s.	d.		s.	d.		s.	d.		s.	d.	s.	d.
Superphosphate (3 parts) and Sulphate of Ammonia (1 part)—597 lb. per acre—																						
Marketed up till—																						
26 July, 1931 ...	71	59	3	17	9	11	4	1	4	70	6	73	60	10	6	3	6	1	0	4	64	8
17 Aug., 1931 .	66	38	6	28	11	8	10	2	1	52	3	87	50	9	7	2	11	8	1	8	55	4
Total	137	97	9	45	21	7	14	3	5	122	9	160	111	7	13	6	5	9	2	0	120	0
Superphosphate (4 parts) and Sulphate of Ammonia (1 part)—560 lb. per acre—																						
Marketed up till—																						
26 July, 1931 ...	76	63	4	8	4	8	4	1	4	69	4	78	65	0	3	1	9	1	0	4	67	1
17 Aug., 1931 ...	75	43	9	36	15	0	12	2	6	61	3	106	61	10	9	3	9	3	0	7½	66	2½
Total	151	107	1	44	19	8	16	3	10	130	7	184	126	10	12	5	6	4	0	11½	133	3½
Superphosphate (2 parts), Bonedust (2 parts), and Sulphate of Ammonia (1 part)—560 lb. per acre—																						
Marketed up till—																						
26 July, 1931 ...	81	67	6	5	2	11	1	0	4	70	9	63	52	6	4	2	4	1	0	4	55	2
17 Aug., 1931 ...	86	50	2	11	4	7	16	3	4	58	1	118	68	10	8	3	4	6	1	3	73	5
Total	167	117	8	16	7	6	17	3	8	128	10	181	121	4	12	5	8	7	1	7	128	7
Superphosphate (4 parts), Sulphate of Ammonia (1 part), and Sulphate of Potash (1 part)—672 lb. per acre—																						
Marketed up till—																						
26 July, 1931 ...	62	51	8	6	3	0	..	..		55	2	50	41	8	2	1	2	...	.		2	10
17 Aug., 1931 ...	107	62	5	11	4	7	8	1	8	68	8	126	73	6	8	3	4	5	1	0½	77	10½
Total	169	114	1	17	8	1	8	1	8	123	10	176	115	2	10	4	6	5	1	0½	120	8½
Basic Superphosphate—560 lb. per acre—																						
Marketed up till—																						
26 July, 1931 ...	86	71	8	4	2	4	1	0	4	74	4	67	55	10	2	1	2	...	...		57	0
17 Aug., 1931 ...	97	56	7	5	2	1	8	1	8	60	4	120	70	0	6	2	6	4	0	10	73	4
Total	183	128	3	9	4	5	9	2	0	134	8	187	125	10	8	3	8	4	0	10	130	4

The quality was excellent throughout and the cauliflowers were therefore graded according to weight, first grade averaging 11 lb., second grade 8 lb., and third grade 7 lb. Up till the end of July first grade was valued at 10s., second grade 7s., and third grade 4s. per dozen. During August the prices fell to 7s., 5s., and 2s. 6d. respectively.

The results obtained in this trial would seem to indicate that basic superphosphate is the most profitable fertiliser to use for cauliflowers under the conditions prevailing last season. However, the treatment that gave the best results in previous years, namely, light dressings of a mixture of sulphate of ammonia and superphosphate at time of transplanting, followed later by a top-dressing with sulphate of ammonia, again showed up so well that it appears safe to recommend it as the most reliable treatment in normal years. The use of potash proved to be a waste of money, while increasing the amount of sulphate of ammonia in the superphosphate-sulphate of ammonia mixture, was also unprofitable. This latter treatment delayed maturity.

The substitution of bonedust for portion of the superphosphate in the mixture did not prove an advantage under last season's conditions.

Effect of Fertilisers on "Whip-tail" Disease.

Mr. J. Smith, of Cornwallis, co-operated in carrying out a trial to observe the effect of various fertilisers on "whip-tail" disease of cauliflowers. A number of fertiliser mixtures were tested, and half the area of each plot was limed some time before the plants were set out in the field.

John Gardener's Four Months.

Although the trial did not prove altogether satisfactory, counts of heads cut from the plots favoured the portions that had been treated with lime, while the fertiliser mixtures that appeared to produce the best cauliflowers were those consisting of four parts superphosphate and one part sulphate of ammonia, and of two parts bonedust, two parts superphosphate and one part sulphate of ammonia. Even in the case of these mixtures the limed section showed to best advantage. It was also noticed in the limed plots that late-maturing plants appeared to grow a few late leaves comparatively free of "whip-tail," and then produced marketable heads.

The assistance of Mr. C. J. Magee, Assistant Biologist, in planning this trial, and in making inspections during the progress of the experiment is thankfully acknowledged.

Variety Trials at Windsor.

The majority of the varieties grown in this district are selections made by individual growers, the selections usually being named after the originator. Early-maturing types are finding most favour, being considered better yielders over a period of years and less liable to disease and insect attack than the late-maturing varieties, which occupy the ground for a longer period.

A number of trials were carried out last season, and the following remarks are based on observations made as to the behaviour of the different varieties. Actual weight of cauliflowers harvested are not given, quality, percentage of heads cut, &c., being considered better indications of a cauliflower's market value.

A. J. May's Four Months.—A local selection and one of the most successful on the heavier types of soil. On Mr. Gardener's property this variety cut 100 per cent. heads.

Nuggets.—Another local selection of outstanding merit. The plants are outstanding, having very deep green foliage, and short main stems, giving them a very compact appearance. The curd is rough, compact, and solid. Nuggets is noted for its standing qualities.

John Gardener's Four Months.—This is one of the best types tested to date. The plant is medium in size, with excellent curd that is capable of standing for some time without becoming over-mature. The head is only partly protected and nearly always cuts 100 per cent. marketable heads.

John Gardener's Five Months.—At Windsor this type is larger than the four months selection. The curd is very large, heavy, and of very good quality.

John Gardener's Six Months.—A type distinct from those previously described. The plant is big and capable of producing very large heads of first-class quality. In the trial at Windsor this variety produced 100 per cent. first-grade heads.

Four Months Special Giant.—The most outstanding feature of this variety was uniformity of maturity—a very desirable feature. It takes four and a half months to mature. The flowers are medium size, and of very good quality.

Early Snow White.—Very erratic yielder in coastal areas.

Maitland Market.—Does not appear to be suitable for this district.

Five Months Special Giant.—An excellent type, outstanding at all stages of growth. The curds are very well developed around the stem, being large, clean, pure white in colour, and as well protected as any variety previously tested.

Variety Trials at Wellington.

Mr. W. Cole co-operated in this instance, seed being sown on 8th January, 1931, and the plants transplanted on 22nd February. Harvesting commenced on 26th May and continued till the end of September. The percentage of marketable heads cut from each plot was as follows:—Gardener's Five Months 95 per cent., Late Phenomenal 90 per cent., Mitchell's Four Months 83 per cent., A. J. May's Four Months 76 per cent., Early Phenomenal 69 per cent., Early Snow White 60 per cent., White Queen 64 per cent., Four Months Special Giant 52 per cent., Nuggets 43 per cent. Of the first four varieties only Late Phenomenal was grown from commercial seed, the others being local selections.

John Gardener's Five Months.

Gardener's Five Months not only cut the greatest percentage of heads, but also the largest, some weighing up to 22 lb. This variety is well protected by its leaves from frost and weather injury.

Late Phenomenal.—Over a number of years Late Phenomenal has proved the most reliable of all commercial varieties. The curd is firm and of very high quality, it stands well, and has a very clean appearance. The variety is self-protecting.

Mitchell's Four Months.—At Wellington Mitchell's Four Months produced only a small amount of leaf growth. The curd was large, clean and of good quality.

It is apparent from the foregoing results that western growers would be well advised to grow locally-selected seed, or, failing that, the most reliable commercial variety, namely, Late Phenomenal. Seed of the best selections of early-maturing varieties is not available, and if it is desired to grow an early-maturing type, there is little to choose between Early Phenomenal, Early Snow White, and White Queen.

The Dubbo Variety Trials.

The variety trial conducted by Mr. J. C. Rowcliff, at Dubbo, was most satisfactory. The seed was sown on 11th February, and the plants set out in the trial plots on 11th March. The length of time the different varieties took to mature was as follows:—White Queen (Anderson's) 144 days, Mitchell's 153 days, Four Months Special Giant 173 days, J. Gardener's Five Months 190 days, Nuggets 190 days, Early Phenomenal 191 days, Late Phenomenal 231 days, Orchitis 207 days, while Late Metropole was too late to be of any value.

The following are observations made as to the behaviour of some of the varieties under trial:—

White Queen.—The early maturity of this variety makes it one of the most valuable to grow, in the Dubbo district. The curd is very clean, white and well covered. As with most early varieties, this is not a good keeping type, being rather soft in texture, and breaking up readily.

Mitchell's.—This was the most outstanding variety in the trials. All the flowers were large, clean, white, of excellent texture, and well protected.

Nuggets.—The plants of this variety were very uneven, short in the stem, while the leaves were of a very dark-green colour. The curd was rough on the surface, but very solid and of good keeping quality.

Gardener's Five Months.—A good type, being fairly large, semi-protected and of good quality.

Four Months Special Giant.—A high quality, rather small flower, of sweet flavour, very white colour and well protected.

Orchitis.—A rather unsuitable type, open and almost unprotected.

Variety Trial with Mr. E. Offner, Dubbo.

Mr. E. Offner also carried out variety tests at Dubbo, in this case on river soil, and it is interesting to note the variations shown by the same varieties under different soil conditions. The alluvial soils being rich in organic matter are most suitable for the growth of winter cauliflowers.

White Queen.—Grown on alluvial soil, this variety proved to be an early-maturing type with a rather compact head, and turned out quite a good keeper. The heads were rather small, but very round and clean.

Early Phenomenal.—It matured in four months on the alluvial soil. The curd was very white, clean, and self protected, but was inclined to be soft.

Orchitis.—Matured in six months. The curd was very small and open. An unsuitable type.

Gardener's Five Months.—An excellent type. The heads were large, with clean high-quality curds.

Late Metropole.—A poor quality variety, mainly due to the curd being soft, easily stained, and of poor keeping quality. It matured in seven months.

Nuggets.—A very even type, the curd of which is even, medium in size, and well covered. Matured in five months.

Special Four Months.—A large, clean, good quality type. It took four and a half months to mature.

Special Five Months.—A good quality type, but smaller than the four months variety. It matured in five months.

Mitchell's.—Matured in four months. An outstanding variety. The plants were all very even, and the curds compact and well developed around the stem. The quality was excellent throughout, while the leaves afforded complete protection to the curd.

CABBAGE AND CAULIFLOWER TRIALS AT BATHURST.

THESE trials, which have been in progress for some years now at Bathurst Experiment Farm, were continued last season. The season was a very favourable one, and the results, generally, were in a line with those obtained in previous years.

YIELDS in the Cabbage and Cauliflower Trials.

Group.	Cabbages.			Cauliflowers.		
	Varieties in Order of Merit.	Date first Cabbages Matured.	Weight per Plot of 50 Plants.	Varieties in Order of Merit.	Date first Heads Matured.	Weight per Plot of 50 Plants.
		1931.	lb.		1931.	lb.
Ballhead ...	Enkhuisen Glory ...	16 May ...	311	Six Months Special Giant.	17 July...	269
Drumhead ...	Succession	9 ,, ...	300	Phenomenal Main-crop.	25 ,, ...	243
Wakefield ...	Winningstadt ...	16 ,, ...	266	Five Months Special Giant.	4 ,, ...	170
Copenhagen Market.	Copenhagen Market..	16 ,, ...	209	Four Months Special Giant.	20 May ...	146
Wakefield ...	Early Jersey Wakefield.	2 ,, ...	162	Giant Reliance ...	25 ,, ...	120
Ballhead ...	Yates Utility ...	30 ,, ...	159	Early Snow White ...	20 ,, ...	117
Drumhead ...	Russian Cabbage ...	30 ,, ...	107	Early Phenomenal ...	18 ,, ...	116
				Ifield	25 ,, ...	100

In the cabbage trials, Enkhuisen Glory put up the best performance, and the excellent keeping properties and good quality of this cabbage should ensure for it a wider planting, particularly in conjunction with Succession, a later-maturing type, and one that also forms solid hearts of very good quality. Further experiments will be needed to determine which is the better of the two varieties, Winningstadt and Early Jersey Wakefield.

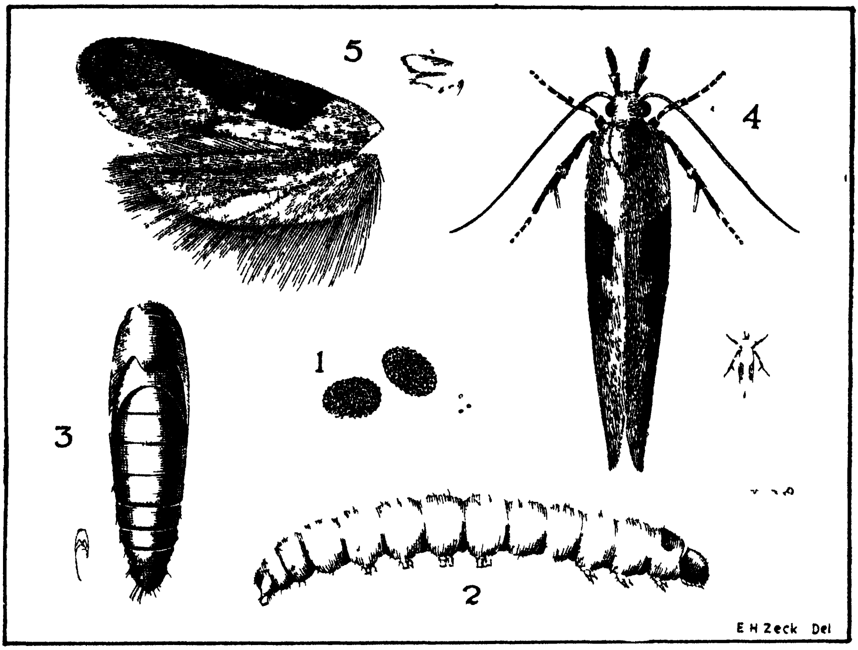
In the cauliflower trials, the later maturing varieties gave the highest yields. Of the early maturers, Four Months Special Giant and Early Phenomenal yielded the best quality heads, although they lacked the size of the later-maturing varieties.

The Tomato Stem Caterpillar.

(*Phthorimaea plaesiosema* Turner.)

W. L. MORGAN, B.Sc.Agr., Assistant Entomologist.

DURING 1930-31 some of the tomato crops on the coast between Sydney and Newcastle were damaged by small greenish-yellow to white caterpillars which bored into the stems of the plants. The stems of young plants became blackened and shrivelled, the leaves wilted, and the plants died rapidly; other plants sickened and died prematurely.



Tomato Stem Caterpillar (*Phthorimaea plaesiosema*, Turner)
1. Eggs. 2. Larva or caterpillar 3 Pupa or chrysalis 4 Moth in characteristic resting position. 5 Fore and hind wings of moth
NOTE The small figures in each case are shown actual size

The caterpillars proved to be the larvae of the moth *Phthorimaea plaesiosema*, described as a new species by A. J. Turner in 1919 (*Proceedings of the Royal Society of Queensland*, vol. 31, page 126). The larvae are known to have infested tomato plants in the Sydney district as early as 1923, and have since been recorded from the Gosford, Newcastle, and Windsor districts, but not until last summer and autumn did any serious damage occur. During 1930 a light infestation of the fruit in one tomato crop was noted, one and sometimes two caterpillars occurring in a fruit. They appeared to enter the fruit at its attachment with the stalk or pedicle, and although feeding was not extensive they sometimes tunnelled towards the centre of the fruit. This damage should not be confused with that of the maize and tomato moth caterpillar (*Heliothis obsoleta*), which gouges out a large hole in the fruit.

At Carlingford, Sydney, a potato crop was considerably damaged in October, 1930, by the tomato stem caterpillar, the larvae of which bored into the stems. The moth was later also bred from potato tubers, the infestation being similar to the attack of the closely allied potato moth (*Phthorimaea operculella*).

Life History.

In view of the prevalence of this moth during 1930-31 a short study of the life-history from egg to adult, and of its manner of attacking the plant, was made with a view to devising means for control. Tomato plants enclosed in glass chimneys and potato tubers in glass jars were used in the breeding experiments.

The Eggs.—The eggs were laid singly on the foliage of the tomato plants and in the "eyes" of the potato tubers or in cracks or scars. The eggs (Fig. 1) are extremely small (1/50 inch by 1/80 inch), white in colour, ellipsoidal to irregular in form, and with numerous minute indentations on their surface (see illustration). The eggs hatch in from seven to eleven days.

The Caterpillar.—The young caterpillars mine into the tissues of the leaves, but usually they feed upon a minute patch of the leaf surface before entering the leaves. From the leaves they make their way into the petioles or leaf-stalks, working down these into the stems. The larvae (Fig. 2) when fully developed are approximately ½ inch in length. In potato and tomato plants they are white to greenish yellow in colour, but in potato tubers the upper surface of the abdomen is usually pale pink, broken by two irregular white bands extending along its length.

Extending backwards in the form of an arc from the front margin of the dorsal surface of the first thoracic segment is a lightly chitinized shield, light brown in colour. The head is dark brown. In addition to the three pairs of true legs there are four pairs of prolegs and a pair of anal claspers. The larvae pupated in the tomato stems in small silken cocoons, but left potato tubers to pupate in the soil. During the warmer weather the larvae pupated within twenty-one days of hatching, but in winter approximately six weeks elapsed before pupation occurred.

The Pupa.—Approximately ¼ inch in length. The pupa (Fig. 3) is at first white to pale green, but rapidly changes to brown. The adult emerges ten to fourteen days after pupation.

The Adult.—A light greyish-brown moth, measuring slightly more than ⅓ inch in length, with the wings folded along the length of the body (Fig. 4), and slightly less than ⅔ inch across the outspread wings. Forewings (Fig. 5) narrow, with the tips light brown and having very distinct characteristic dark brown patches near their centre. Hind-wings lighter, with wide fringes. The adult is readily distinguished from the potato moth by the brown markings on the wings.

The moths when fed on honey and water solution lived for three to four weeks, and in the case of one individual for thirty-seven days. The females commenced egg laying seven to nine day after emergence and continued for from seven to eighteen days. Records of oviposition from three separate females gave 382 as the greatest number from one female and 229 the least, indicating that each female lays on an average about 300 eggs.

During the summer and early autumn two generations of moths developed in slightly less than four months, but the third generation, bred during the winter, required approximately four months for its development.

Control Recommendations.

1. Spray with lead arsenate (1½ lb. powder to 20 gallons water) or dust with a 50 per cent. lead arsenate dust at weekly intervals.

2. Burn all dead or badly infested plants so as to destroy the larvae and pupae.

It should be borne in mind that a potato crop adjacent to tomatoes may be a source of infestation.

Selected Citrus Buds.

THE CO-OPERATIVE BUD SELECTION SOCIETY, LTD.

For some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with the view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the ægis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society *does not and cannot make profits*, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best types of quality fruit and of reputed good bearing habits only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society, Ltd., supplied the following selected buds to nurserymen during the 1931 budding season, trees from which should be available for planting during the 1932 planting season:—

Nurseryman.	Oranges.		Emperor Mandarin.	Eureka Lemon.	Marsh Grapefruit.	Total.
	Washington Navel.	Valencia.				
L. P. Rosen and Son ...	8,000	11,000	2,000	2,000	2,000	25,000
T. Adamson	2,000	2,000	700	1,000	500	6,200
Swane Bros.	1,000	1,000	250	500	500	3,250
Geo. McKee	1,000	2,000	...	...	...	3,000
C. Langbecker	...	750	...	...	250	1,000
F. Ferguson and Son ...	2,000	3,000	...	...	...	5 000
A. T. Eyles	3,000	2,000	...	...	...	5,000
R. Hughes	500	500	250	500	1,000	2,750

—C. G. SAVAGE, Director of Fruit Culture.

The Control of Ked (Tick) in Sheep.

MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon.

ALTHOUGH sheepowners generally are fully in accord with even stringent action aiming at the control of lice in sheep, the same unanimity does not exist regarding ked (tick). It is claimed, firstly, that the ked does comparatively little harm, and, secondly, that it is far more difficult to eradicate. Within limits both these points may be conceded, and the Department has always recognised them and has at no time acted with the same stringency regarding ked as it has regarding lice. At the same time it must be admitted that the gross infestation with ked which is sometimes seen is detrimental to the sheep. Moreover, many owners desire to keep their sheep as free from ked as possible, and as this number is constantly increasing it is not desirable that the owners of such sheep should be subjected to the risk of flock infestation from neighbours' sheep or travelling sheep. Complaints have also been received on many occasions regarding the possible danger of infestation of clean sheep with ked dropped from infested sheep in railway trucks, and whilst this is not considered to be a method of infestation which would operate frequently, the possibility cannot be denied.

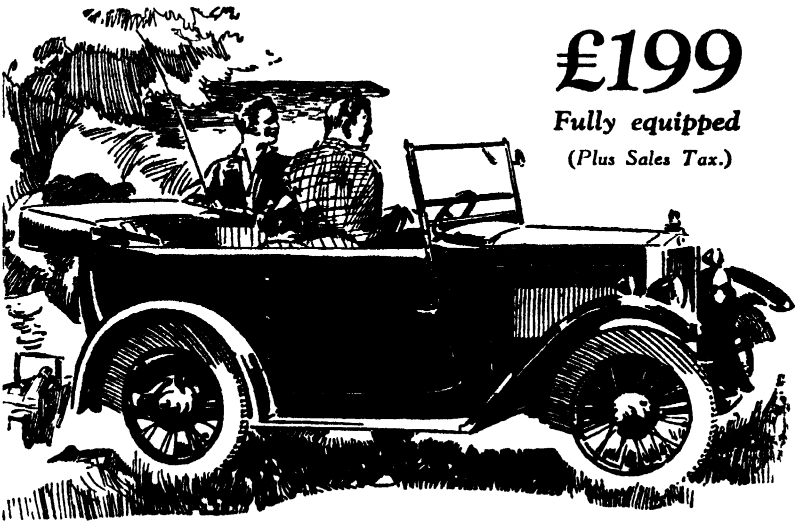
Sheepowners Alive to the Benefits of Dipping.

The very marked increase in dipping which has taken place of recent years in all parts of the State, except portions of the Western Division (where it is not so necessary), indicates clearly that sheepowners are alive to the beneficial results to be obtained by maintaining their flocks free from external parasites.

Those portions of the State from which most complaints were received regarding the action taken against ked by the Department were portions of New England and Monaro, and consequently it was decided that observations should be carried out in these areas.

Before the actual dipping operations were observed, the statement that the ked could survive for protracted periods off the sheep was investigated, and the evidence obtained supports the view taken by the Department that this does not occur. It is evident from these experiments that the greater the shelter the longer the life, and the possibility of the woolshed remaining a source of infestation for some days might be taken into consideration. Any such danger would, however, be easily obviated by maintaining the woolshed in a thoroughly clean condition, a procedure of marked importance from other aspects.

There is no evidence whatever in support of the statement sometimes made that the ked breeds in scrub and timber, and such would be contrary to everything known of its life-history or of similar parasites on other animals.



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It has long been recognised that with some dips a certain proportion of pupae resist the action of the dip, but the destruction of these is brought about afterwards, with most dips, by the material retained in the wool of the sheep after dipping. However, a double dipping has often been advocated. Notwithstanding this, many graziers have assured officers of the Department that, provided they dip with sufficient care and ensure a complete muster, they are able to maintain their flocks free from ked (tick), even in districts which are not regarded as free from ked.

On several occasions on which complaints were received that the tick could not be kept out of the flock, the methods of dipping were inquired into, and it was quite evident that loopholes for the survival of the ked were in many cases provided by the methods adopted at dipping and the manner in which the dipping was carried out. These, however, were scattered observations, and did not include a consideration of all the factors involved in the persistence of ked.' The investigation then planned was intended to cover all such points.

Faulty Dipping Favours Reinfestation.

Reports show that it is possible to maintain a flock free from ked from dipping to shearing with one dipping in a suitable dip properly and carefully carried out, provided outside sources of infestation can be guarded against, but that the difficulties in bringing about such immunity from outside infestation are considerable. Obviously, however, if the practice of correct dipping is sufficiently widely carried out the opportunities for such infestation to occur from outside are greatly minimised. By continued effort on the part of the graziers and graziers' associations these risks can be reduced to a minimum.

A number of flocks were under observation by Inspector Beardwood, B.V.Sc., in the Bombala district, and the following loopholes leading to continued infestation were noted by him:—Failure to duck all sheep thoroughly, dipping done too hurriedly, ration sheep not dipped, extra care not taken with rams and unshorn lambs, undipped and infested sheep belonging to a neighbour gaining access to the paddocks, the presence of one unshorn infested lamb in a mob of shorn sheep.

Investigations were also carried out by Dr. Seddon, Director of Veterinary Research, and Mr. Blumer, B.V.Sc., District Veterinary Officer in New England. The loopholes detected by them as proved or possible means of reinfestation of dipped sheep were:—

1. Interval between dipping and shearing. In one case rams were dipped a week off shears, and in another ewes were dipped two to three weeks off shears. The dip makers recommend one month to six weeks off shears.

2. Variation in effectiveness of dips.

3. Makers' instructions not always carried out in mixing of dip.

4. Sheep in dip too short a time. The makers of dips recommend immersion for one minute. In some cases sheep were only immersed for twelve seconds.

5. Insufficient ducking of sheep.
6. Odd sheep not dipped.
7. Failure to obtain a clean muster.
8. Insecure boundary fences.
9. Sheep sent away on agistment and brought back infested.
10. Strangers gaining access to the paddocks.
11. Crowding of travelling sheep on to a boundary fence.

The full reports of the various officers concerned will be published by the Department as a Science Bulletin.

SIX CALVES FROM TWO COWS IN SIX WEEKS.

SOMETHING in the nature of a record in calf production was recently put up on the farm of Mr. A. T. Wattus of Thornton, near West Maitland, by two cows producing six calves—one four and the other two—within a period of six weeks.

The illustration below shows "Darkie"—a six-year-old Jersey-Durham cross—and her four fully developed calves (two males and two females, born on 10th June, 1931) when they were five weeks and four days old. The other cow "Splinter," estimated to be eighteen years old, produced twin female calves on 24th July, 1931.

We are indebted to Mr. F. J. P. Burley, of West Maitland, for the photograph and details.

"Darkie," a Jersey-Durham cross Cow, and her Four Thriving Calves.

IN a general way, and for all-purpose feeding, a pound of cracked wheat or a pound of cracked barley, or a pound of both in any proportion, is equal in feeding value to a pound of corn.—Miscellaneous Publication 96, U.S.A. Department of Agriculture.

Poisoning of Sheep by Quinine Bush or Bitter Bark (*Alstonia constricta*).

H. M. COPELAND, Inspector of Stock, and H. R. SEDDON, D.V.Sc.,
Director of Veterinary Research.

SOME two years ago at Moree symptoms of a nervous disorder, followed by death in certain cases, were seen in some sheep which had access to and ate voluntarily bushes of the above. These sheep had little grazing, and it was apparently on account of shortage in that regard that they took to eating the leaves from the lower branches of the quinine bush or tree. This bush grows commonly throughout a large part of the north-west, but except on rare occasions does not appear to have been responsible for mortality in stock, although Maiden in *Forest Flora of New South Wales*, vol. 1, page 46, states that the bark of the tree contains alkaloids which resemble in properties those of quinine and strychnine.

When branches of the tree were cut and offered to sheep it was interesting to note that, whereas sheep would eat from certain trees, from other trees they would not. Attempts were made to confuse the sheep, but such could not be done. Thinking there might be some botanical difference—although the trees looked the same—specimens were submitted to the Director, Botanic Gardens, but no difference was detected.

In order to test the matter further and to get some definite information as to the quantity required to produce symptoms and the period taken to develop, a feeding test was arranged. The bush used was naturally that which sheep will eat without difficulty, and it was definitely identified by the Director, Botanic Gardens, as *Alstonia constricta*, and it may be stated here that this tree is variously known as quinine bush, bitter bark, Peruvian bark, fever bark, &c. All these refer to the fact that the bark has the bitter taste of quinine. The leaves are palatable, having also a bitter taste though not so bitter as the bark. When eating them sheep will naturally eat some of the leaf stalks (which are bitter) and even small stems.

The Experiment.

For the purpose of testing the tree for poisonous properties three eighteen-months-old Merinos (castrated rams) A. B, and C and a Merino weaner were used. The tree was then seeding, and twigs of leaves and young seed pods were gathered and fed fresh to the sheep. At first the sheep did not take readily to the tree, but after three days each sheep partook on an average three pounds daily.

Symptoms were first noted in the case of the weaner. This animal showed symptoms on the eleventh day; one of the rams became ill on the seventeenth day, another on the twenty-first day, and as the third ram was then showing slight symptoms it was placed in the paddock. This last-mentioned animal was normal six days later.

The first symptom noted is a reddening of the mucous membrane of the eye, and this occurred even earlier than the period mentioned above, which represents the period when definite nervous symptoms were first observed. These nervous symptoms are gradual in onset, but when developed so affect the muscles of the limbs and body muscles that the limbs are held rigid and the body stiffened with the head thrown back. At the same time the animal is in a very excited state, and on being touched or hearing a noise gives a nervous jump. The mouth is hard to open, but the jaws are not locked. The animals soon cannot maintain their balance and fall to the ground, especially if an attempt is made to make them walk. These symptoms take several days to develop to this stage, and in the case of one animal led to death. In the case of two others, as the animals could not stand they were destroyed for post-mortem examination. As was to be expected, no marked lesions were seen in the thoracic or abdominal organs, and the symptoms seen are no doubt due to poisoning of the nervous system.

It is interesting to note that two dogs fed on portion of the muscle of one of these animals developed nervous symptoms similar to the above, but not so intense, and fortunately both had recovered next day.

Conclusions.

This experiment shows definitely that the leaves and fruits of this tree are poisonous for sheep if eaten in quantity over a period of two or three weeks. Stock in the Moree district commonly have access to the tree, and have been seen to nibble at it even in good seasons. In ordinary seasons, when there is ample grazing the tree is not to be considered harmful, but in dry times, when sheep are forced to search for food, they will readily take to it and, eating it in large quantities over a period, may become poisoned. The symptoms in general resemble those of strychnine poisoning, and in cases where stock have been poisoned the same antidotes might be used. More important is it, however, to place animals where they cannot get to the tree. From observations made it would appear that sheep seek out the young seed pods, and possibly these are more dangerous than the leaves.

INFECTIOUS DISEASES REPORTED IN OCTOBER.

The following outbreaks of the more important infectious diseases were reported during the month of October, 1931:—

Anthrax	6
Blackleg	8
Piroplasmosis (tick fever)	1
Pleuro-pneumonia contagiosa	3
Swine fever	Nil.
Contagious pneumonia	1
Necrotic enteritis	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

The Effect of Drought Rations on Sheep.

TRIALS AT HAWKESBURY AGRICULTURAL COLLEGE.

[Continued from page 876.]

F. WHITEHOUSE, B.V.Sc., Veterinary Surgeon, Stock Branch, and J. C. COTSELL, Assistant Sheep and Wool Instructor, Hawkesbury Agricultural College.*

The Comparative Nutritive Values of the Rations.

In any comment on the relative values of the different rations it is considered that the maintenance of condition, number of deaths, and the cost, should be primary considerations, the growth, condition, and weight of the fleece being secondary considerations.

GROUPS I, VI, AND VII.

The very weak and emaciated condition of the sheep in Groups I, VI, and VII has already been referred to. Two deaths occurred in Group I early in the trial; no post-morten was held on the first, but the second death, where a considerable quantity of sand was found in the abomasum, was probaly due to stomach worms. The deaths in Groups VI and VII can be attributed to drought conditions—starvation, absence of visible body fat and advanced anaemia being pronounced—while the sheep in Group VI which died was penalised by a shoulder injury.

Although, as mentioned previously, the wool weights do not represent accurately the state of the wool growth, it is significant that they are lowest in Groups I, VI and VII, and the growth during the first eight months of the trial was least in Groups I and VII.

It is considered that tho rations, in the quantities fed, are not sufficient to maintain sheep in reasonable condition for such a lengthy period.

Analyses of the rations fed to the sheep in Groups I, VI and VII and comparison of them with those fed to other groups reveal interesting points:—

Ration VII (straw and maize) has a very wide nutritive ratio, 1 : 24.5, and though the total digestible nutrients are almost normal, this lack of protein may account for the very heavy loss of body weights, and the emaciated appearance encountered in that group. With rations I and VI, however, the analyses show nutritive ratios sufficiently narrow and total digestible nutrients respectively equal to and only slightly lower than that sufficient to maintain a sheep in good condition.

Ration V, on which the sheep fared remarkably well both in weight and appearance, was lower in total digestible nutrients and broader in nutritive ratio than any of these three rations; again Group II sheep with both lower total digestive nutrients and an equal or wider nutritive ratio than either Groups I or VI, while losing only slightly less weight, showed more bloom.

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* Mr. L. H. Beveridge preceded Mr. J. C. Cotsell as Assistant Sheep and Wool Instructor and during portion of the experiment assisted in the collection of the data.

Group VIII sheep also, with an approximately equal nutritive ratio and appreciably lower total digestive nutrients, fared considerably better than Group I, VI, or VII, and were much superior in appearance.

This comparison of Groups I, VI and VII with Groups V, II and VIII points very strongly to there being other factors than total digestible nutrients and nutritive ratio concerned in the production of a drought-stricken appearance, with attendant loss of vigour and spirit. Particularly striking is the contrast of Groups I and II, where total digestible nutrients and nutritive ratio were slightly in favour of Group I. Although their losses of body weight were approximately equal, Group II sheep at no time showed the dejection and emaciation seen in Group I. Obviously emaciation and loss of vigour are not necessarily concomitants of loss of body weight and point to a deficiency of a nature not yet known. Lick was provided to counteract mineral deficiencies (though it did not contain iron), and it is considered that the ineradicable small shoots of grass, mainly couch, round the pens provided sufficient vitamins, and no doubt a small amount of amino acids.

In cases where the total digestible nutrients and nutritive ratio approximate those of a maintenance ration, it is thought that possibly an amino acid deficiency might be the cause of the drought condition. It is significant that the addition to Groups I, VI and VII of 0.5 lb. lucerne hay daily, during the last six weeks, while it did not check the decline in weight, produced a much brighter appearance and more vigour, and probably saved the lives of the sheep in these groups. It is questionable whether an increase of the same ration would have done so.

GROUP III.

Ration III, consisting of 2.5 lb. of lucerne hay, later reduced to 2.25 lb., cannot be regarded as a drought ration; it is a maintenance ration. The performance of this group with regard to body weight was excellent; the average total loss was only 9 lb., and at one time, four months from the commencement, the group showed a gain of 2.5 lb. over their primary weight. Brightness and vigour were always evident in this group, and the fleece production was good—second highest weight and growth during the period, 60 per cent. sound fleeces during the first eight months and 100 per cent. sound fleeces for the last four months.

The single death which occurred in this group of a sheep which from the start had been weak, is not ascribed to the ration fed.

Analysis of the ration shows sufficiently high total digestible nutrients and a narrow nutritive ratio (1 : 3.9), and it could be expected that good results would be obtained on such a ration.

GROUP V.

The performance of the survivors of this group, fed on a ration of 12 oz. maize per head per day, is remarkable. Unaccompanied by any other fodder, a single concentrate low in those amino acids essential for maintenance, viz., tryptophane, and possibly tyrosine, was fed. High as was the amount fed, this deficiency could not be made up; the total digestible nutrients were only 50 per cent. of what is considered essential for maintenance, the nutritive ratio a little wide, and bulk and fibre were deficient; yet, in spite of these disadvantages, the total loss of body weight of the survivors was only 18 lb. after twelve months. Further, these two sheep in Group V were the only sheep to register an increase in weight after shearing, over and above that indicated by the loss of the fleece. Also, during the last five months, when presumably they had become accustomed to the ration, they had lost only 1.5 lb. It was very noticeable that they were always the most vigorous group in the trial. It is generally held that sheep cannot synthesise these amino acids, and therefore the only source from which these could be obtained would be the small growth of couch and other grasses in and around the pen. The amount ingested must perforce have been small.

The fleece weights were average, one was sound, one slightly tender, and both in the last four months, sound. They showed bigger growth during the first six months under trial conditions than any of the other groups.

Except for one factor, this would appear to be a satisfactory ration. Three deaths occurred, however, and it is not considered that generalisations can be made from two survivors out of five. Unfortunately, the absence of the supervisors precluded post-mortems on two of these sheep. The first to die, three weeks after the commencement of the trial, was examined in an early stage of decomposition, but no sand was found in the digestive organs. At the end of three months another sheep died after obvious, extended sickness, and the post-mortem revealed a large quantity of sand in the abomasum and couch grass roots in the rumen. Death was due to erosion of the gastric mucous membrane with subsequent absorption of drench administered the previous day. The third ewe to die (in October) had apparently been in good health and had maintained its primary weight of 86 lb. Unfortunately, it was not examined, but death occurred two days after drenching. Its death could not then be directly imputed to the ration.

It was to be expected that the feeding of such a ration where bulk was lacking and the sheep were constantly searching for it, would result in a certain amount of sand ingestion. Proof was furnished by the couch roots found in the rumen. This ingestion would be facilitated by the feeding on freshly-ploughed land, even though the concentrates were fed from a trough.

GROUPS II, IV AND VIII.

Ration No. II would appear to be the most satisfactory ration of the trial in all respects. The body weight loss over twelve months was 23 lb. (30 per cent.), but at no time did the sheep appear emaciated or dejected, but rather always appeared active and strong. At the end of twelve months two were forward stores and three fair. No deaths occurred.

The wool production was good, 80 per cent. sound, and subsequently 100 per cent. sound; fair weight and good growth were recorded during the first eight months.

The nutritive ratio was approximately the minimum required for maintenance, and the total digestible nutrients slightly lower than the accepted minimum.

Rations Nos. IV and VIII may be considered as fairly satisfactory rations, subject in each case to a disability.

Group IV maintained good condition throughout, and at the end of the trial four sheep were forward stores and one fair. The loss of 23.6 lb. (or ·25 per cent.) is not excessive; actually this performance is better than appears at first sight, as the group commenced with the highest body weight (viz., 92 lb.). No deaths occurred.

Wool was 80 per cent. sound, and subsequently 100 per cent. sound. This group recorded the highest fleece weight of all groups, and showed a fair growth during the first eight months, with good handling qualities.

The loss of body weight in Group VIII (23.8 lb.) is not irrecoverable, and activity and vigour were moderately well maintained. The individual performances here were spoiled somewhat by the bullying of one sheep. However, at the end of the trial, two were forward, two fair, and one emaciated (this one died later). No deaths occurred during the period.

50 per cent. sound subsequently. Growth during the first six months under trial conditions was short, although weight was high.

The deprecating factor with this ration is the poor wool growth, all the fleeces being tender or broken during the first eight months, and only

The Post-mortem Examinations.

Sheep No. 401 (ex Group I) died on 20th April, 1929. No post-mortem was held within a reasonable time, and the cause of death is unknown. No sand was found in the abomasum.

Sheep No. 423 (ex Group V) died on 20th April, 1929. No post-mortem held.

Sheep No. 402 (ex Group I) died on 26th May, 1929. The post-mortem revealed a double handful of sand in the abomasum, and the intestines inflamed. The sheep was drenched on 25th May, and possibly absorption had occurred through the abraded mucous membrane; the sheep was in very fair condition.

Sheep No. 424 (ex Group V) died during the night of 25th June, 1929, and a post-mortem was conducted on the afternoon of 27th June. The sheep was in poor flesh, but there was much internal fat. There were many nodules in the large bowel and some in the small bowel. Throughout were sand granules. The abomasum was much inflamed, and contained approximately two handsful of sand. The contents of the abomasum were sandy, and there was earth together with many pieces of couch root. The liver was congested, also the kidneys, but the latter were not healthy, and the capsules stripped off easily. Both lungs showed congestion. The heart was swollen and the musculature injected, and the blood clots were semi-fluid even though the animal had been dead thirty hours. The pericardial sac was distended with a dark bloody fluid; the spleen was apparently normal. The sheep had been ailing for over a week, and died from toxaemia as a result of sand irritation. Undoubtedly death was hastened by the effect of drench on an eroded mucous membrane of the abomasum—the sheep had been drenched on 25th June, 1929. In three months this sheep had lost 18 lb. in weight.

Sheep No. 422 (ex Group V) died on 25th October, 1929. No post-mortem was held.

Sheep No. 435 in Group VII was very weak, down, and would not stand on 5th February, 1930. She was *in extremis*. A tonic was administered and green lucerne and lucerne hay were placed before her. She ate some of the lucerne, but died late on 6th February. A post-mortem examination was conducted early on 7th February.

The sheep was emaciated, the fat of the body almost absent, lungs congested; the pericardial sac contained about 5 oz. of a bloody serous exudate; the heart musculature was apparently normal; the spleen was dark and pulpy. On examination of the stomach one noted that the rumen and reticulum were partly full of brown straw coloured ingesta—very moist and apparently well digested—the omasum was not hard, its contents being straw-coloured and soft. The abomasum contained very little ingesta, no sand, and no parasites. The small intestines were nodular, and the large intestines were nodular and contained a number of oesophagostomes; other organs were apparently quite normal.

Sheep No. 434 (ex Group VII) died on 20th February, 1930. She was weak, and in consequence given green lucerne and lucerne hay. She was weaker and *in extremis* on the 20th and died, and a post-mortem examination was conducted early on the 21st February. The ewe was emaciated, and there was no evidence of fat within or without the sheep. The lungs were congested, the pericardial sac full of a bloody serous exudate, the heart musculature was haemorrhagic; the mediastinal membrane was gelatinous; the liver was contracted, dark, and fibrous, the kidneys small and fibrous, the capsules readily stripping off; the spleen was dark, its contents dark and pulpy; the pancreas was dark and "rotten." Of the stomach the rumen was half full of partly digested straw and lucerne, the omasum was soft and well filled with straw-coloured ingesta. The abomasum was empty and normal, there being no worms and no sand. The small intestines were apparently normal, except for nodules The caecum was full of partly digested food and contained many oesophagostomes; other organs were apparently normal.

Sheep No. 415 (ex Group III) had, from the commencement of the experiment, been below the average of her group and her fleece weight was the lowest. No evidence of bullying was noted, but it probably occurred nevertheless. She was found dead on the morning of 28th February, and a post-mortem examination was then conducted. This sheep apparently died without a struggle. The carcase was poor but not emaciated, and carried a fine dry fleece of about 1¼ inches length at the shoulder. The skin was pale pink; the pericardial sac contained a few ounces of straw-coloured serous fluid. The heart musculature was haemorrhagic and the auricles distended with blood clots. The lungs were slightly congested, the abdomen swollen; the spleen was apparently normal; the kidneys congested, the capsules stripping off readily. There was venous congestion of the liver. The stomach and contents were normal except for slight congestion of the abomasum, which contained neither sand nor worms. The bowel, from the pyloric orifice to the rectum, was inflamed, and there was a moderate number of nodules and adult worms in the large bowel. Immediately to the left of a nodule in the large colon was a rupture, and the bowel contents were distributed amongst the mesenteries. The peritoneal cavity contained a dirty brown exudate, contaminated with ingesta, and the serous coats of the bowel, together with the mesentery, were intensely inflamed. The ewe died from enteritis and peritonitis.

(To be continued.)

HARVESTING REQUIREMENTS OF RURAL INDUSTRIES BRANCH DEBTORS.

THE Minister for Agriculture has arranged for essential harvesting wages and cartage expenses of those farmers whose crops are under first lien to the Rural Industries Branch to be met by a release from the crop proceeds of a small sum per bag as the wheat is delivered. Farmers requiring such assistance must make application to the Officer-in-Charge, Rural Industries Branch, G.P.O. Box 2706c, Sydney, stating the area of crop to be harvested, the estimated yield, and the nature and amount of assistance required.

Regarding cornsacks, twine, and the insurance of crops, circulars indicating the policy of the Branch are available on application. Applications for duplicate parts for machinery and tractor fuel will be dealt with in the usual way.

Where the Rural Industries Branch does not hold the first lien, applications for all harvesting requirements should be made direct to the first lienee.

FERTILISER TRIALS WITH SWEET POTATOES AT GRAFTON.

FOR the past three seasons the Department has conducted trials at Grafton Experiment Farm to determine the best fertiliser for sweet potatoes grown on the alluvial flats in the Grafton district.

Superphosphate, and fertiliser mixtures P11 (6 parts superphosphate and 1 part sulphate of ammonia), P13 (6 parts superphosphate, 1 part sulphate of ammonia, and 1 part sulphate of potash), and M22 (equal parts of superphosphate and bonedust), have been tested, and although the last-mentioned two were responsible for increased yields last season, only the P13 mixture showed a profit over cost of application. In this case the net gain per acre amounted to £5 0s. 2d. This same fertiliser has given the best results for each of the three years the trials have been in progress.

Cow Pox (*Variola vaccina*).

SYMPTOMS AND CONTROL MEASURES.

C. C. BLUMER, B.V.Sc., District Veterinary Officer (North).

COW POX is a contagious disease characterised by the appearance of vesicles, or blisters, on the udder or teats of cows, and accompanied by slight body disturbances. The disease is well known in the dairying districts of New South Wales, where it is probable that at some time or other almost every herd has been affected.

Fortunately, the disease itself runs a mild course, but complications set in, in some cases, through infection of the vesicles which are ruptured during milking. A certain amount of immunity is conferred upon cattle on recovery from the disease, and this explains why young cattle appear more susceptible to the complaint than older ones.

The cause of the condition is an exceedingly small micro-organism which passes through filters of certain density, and which cannot be seen under the highest magnifications of the microscope.

Infection commonly occurs during milking, the virus or infective material being carried on the milker's hands from one cow to another. Infection may result, however, through contaminated straw, bedding, &c.

Symptoms.

From four to seven days after infection the symptoms of the disease, including a slight rise of temperature and diminished appetite, may be noted, but in the majority of cases these are so slight as to escape observation. Probably the disease is first noticed during milking, the udder and teats being found to be tender—a cow previously quiet will struggle and kick when being milked or when the udder is handled.

In two or three days hard nodules about the size of a pea appear on the udder and teats, and a day or two later these nodules turn into vesicles or blisters which are filled with a clear, transparent fluid. The blisters are reddish, bluish, or yellowish-white in colour, depending upon the thickness of the skin, and those situated on the udder are generally round in shape, whilst those on the teats are often bean-shaped.

After about a week these blisters ripen and show depressions in their centres, and the contents then turn a creamy colour and dry up into scabs, which ultimately drop off, leaving white, pitted areas.

The number of vesicles or blisters on the udder or teats depends upon the severity of the attack, and varies from two or three to fifteen or twenty, which do not all appear straight away, but at intervals of a day or two. The first vesicles are generally the largest.

When the vesicles occur on the teats they are generally broken during milking and become contaminated with dirt, &c. Deep-seated ulcers may result, and the surrounding skin become inflamed and tender, and healing in these cases may not take place for three or four weeks.

Diagnosis is based on the presence of round or oval vesicles with depressed centres found upon the udder or teats, and the appearance of the condition in other cows of the herd tends to confirm it.

Treatment.

The ruptured vesicles should be treated by applying, after milking, a mildly disinfectant ointment, such as salicylic acid 1 drahm, vaseline 1 ounce.

Milking should be done carefully, so as to injure the tissues as little as possible.

Sponging the sores with a 2½ per cent. solution of zinc sulphate after each milking checks the inflammation. The affected udders should be kept dry and clean.

All affected animals should be milked after the rest of the herd, and the milker's hands should be thoroughly washed in some weak disinfectant solution after milking each animal.

"THE DAIRY MANUAL."

No dairy farmer should be without a copy of the recently issued "Dairy Manual," which contains the Dairies Supervision Act and regulations, detailed directions for the guidance of local authorities, dairymen, milk vendors, &c., in regard to the production and distribution of milk and cream, as well as a complete set of plans for the construction of all necessary dairy buildings. The booklet is obtainable from the Department of Agriculture, Box 36A, G.P.O., Sydney, or from the Government Printer, Phillip-street, Sydney. Price, 1s. 1d. posted.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1932.

Dapto (E. G. Coghlan)	Jan.	8, 9
Albion Park (H. H. Beattie) ...	,,	15, 16
Wollongong (V. Stumbles) ...	,,	21, 22, 23
Kiama (G. Somerville)	,,	26, 27
Kangaroo Valley (L. W. Vance)	,,	19, 20
St. Mary's (T. Green)	,,	30
Berry (Geo. Gillam)	Feb.	5, 6
Nowra (R. King)	,,	11, 12. 13
Milton (G. Prior)	,,	17, 18
Bega (A. O. Manns)	,,	24, 25
Uralla (D. G. Evans)	,,	24, 25
Newcastle (P. G. Legoe) ...	,,	24 to 27
Robertson (W. G. Jenkin) ...	,,	26, 27
Campbelltown (R. A. Sidman)...	,,	26, 27
Tumut (Milton Archer)	Mar.	1, 2
Taralga (W. N. Fitzgibbons) ...	,,	1, 2
Mudgee (T. P Gallagher) ...	,,	1, 2. 3
Cooma (G. E. Metcalfe) ...	Mar	.2 3
Maitland (M. A. Brown) ...	,,	2 to 5
Moss Vale (H. Richardson) ...	,,	3, 4, 5
Gundagai (W. J. Sullivan) ...	,,	8, 9
Dungog (W. H. Green)	,,	9, 10, 11
Camden (G. V. Sidman) ...	,,	10, 11, 12
Goulburn (T. Higgins)	,,	10, 11, 12
Bowral (E. Waine)	,,	11, 12
Gunnedah (M. G. Tweedie) ...	,,	15, 16
Crookwell (A. G. McDonald) ...	,,	17, 18, 19
Kempsey (E. E. Mitchell) ...	April	6, 7, 8
Taree (C. A. Jackson)	,,	7, 8, 9
Wingham (C. H. Blenkin) ...	,,	13, 14
Grafton (L. C. Lawson) ...	,,	13 to 16
Maclean (T. B. Notley) ...	,,	20, 21
Casino (E. J. Pollock)	,,	27, 28, 29
Narrandera (J. D. Newth) ...	Oct.	4, 5

A glorious summer morning; spangled in sunshine; perfumed with a thousand scents of gumtree, bush and field. Let's pack a hamper, swing it aboard the trusty lugger . . . . and then away adventuring into the beckoning silences. Any road will do. All outdoors is a-flower, and beautiful spots are many. Soon---too soon---the daylight fades and one more trip finishes, made completely perfect by the most dependable tyre of all.

DUNLOP

PRODUCT OF DUNLOP PERDRIAU RUBBER CO., LTD.

Department of Agriculture, N.S.W.—High Class Stud Dairy Cattle For Sale.

FINVOY GOLDEN NOBLE (imp N Z Vol 15)
[Stationed at Hawkesbury Agricultural College]

DEPARTMENTAL herds include the following stud bulls —Guernsey Hopeful of Wollongbar (499), Champion, R A. Show, Sydney, 1928. Ayrshire: Scottish Pride of Gowrie Park (3797), First and Champion, R A. Show, Sydney, 1927. First and Reserve Champion, R. A. Show, Sydney, 1928. Milking Shorthorn: Morning Star of Darbalara (Vol. 8), Second R A. Show Sydnev, 1928. Morning Star is ex Melba 15th of Darbalara, World's champion cow of all breeds—32,522 5 lb. milk; 1,614 1 lb. butter fat in 365 days. Jersey· Finvoy Golden Noble (imp. N.Z., Vol 15).

Young bulls available for sale from tested Dams of the following breeds·—

MILKING SHORTHORN. JERSEY. GUERNSEY. AYRSHIRE

Application should be made to—The UNDER SECRETARY, Department of Agriculture, Sydney.

TUBERCLE-FREE HERDS.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number tested.	Expiry date of this Certification.
Wolaroi College, Orange	10	4 Dec., 1931
J. F. Chaffey, Glen Innes (Ayrshires)	75	4 ,, 1931
Department of Education, Brush Farm, Eastwood	6	9 ,, 1931
Lunacy Department, Callan Park Mental Hospital	29	13 ,, 1931
J. Davies, Puen Buen, Scone (Jerseys)	85	14 ,, 1931
Bathurst Experiment Farm (Jerseys)	21	16 ,, 1931
J. L. W. Barton, Wallerawang	17	17 ,, 1931
J. F. Dowe, "Woolomol," Tamworth	59	19 ,, 1931
Wollongbar Experiment Farm, Lismore (Guernseys)	136	21 ,, 1931
Newington State Hospital and Home	108	24 ,, 1931
H. A. Corderoy, Wyuna Park, Comboyne (Guernseys)	59	8 Jan., 1932
New England Girls' Grammar School, Armidale	29	10 ,, 1932
C. J. Parbery, Allawah, Bega	119	10 ,, 1932
New England Experiment Farm, Glen Innes (Ayrshires)	87	12 ,, 1932
W. Spindler, Mt. Pleasant, Bega	66	15 ,, 1932
W. T. Herbert, Racecourse Farm, Bega	68	18 ,, 1932
R. C. Dickson, Elwaton, Castle Hill (Jerseys)	17	20 ,, 1932
Lunacy Department, Morisset Mental Hospital	22	23 ,, 1932
Lidcombe State Hospital and Home	140	11 Feb., 1932
Riverina Welfare Farm, Yanco	77	25 ,, 1932
Department of Education, Yanco Agricultural High School	33	26 ,, 1932
W. M. McLean, Five Islands Road, Unanderra	78	27 ,, 1932
Mittagong Farm Homes	46	3 Mar., 1932
George Rose, Aylmerton	4	4 ,, 1932
Kinross Bros., Minnamurra, Inverell (Guernseys)	66	5 ,, 1932
P. M. Burtenshaw, Killean, Inverell	50	5 ,, 1932
Miss Brennan, Arankamp, Bowral	10	6 ,, 1932
Koyong School, Moss Vale	4	12 ,, 1932
G. A. Parish, Jerseyland, Berry	123	13 ,, 1932
Lunacy Department, Parramatta Mental Hospital	33	16 ,, 1932
Cowra Experiment Farm	32	24 ,, 1932
Hawkesbury Agricultural College (Jerseys)	115	25 ,, 1932
Rydalmere Mental Hospital	73	25 ,, 1932
Russell Lamrock, Orange	4	26 ,, 1932
St. Joseph's Convent, Reynold-street, Goulburn	3	26 ,, 1932
St. John's Boys Orphanage, Goulburn	9	26 ,, 1932
Marion Hill Convent of Mercy, Goulburn	9	26 ,, 1932
Lunacy Department, Kenmore Mental Hospital	79	27 ,, 1932
St. Joseph's Girls Orphanage, Kenmore	9	27 ,, 1932
J. P. McQuillan, Bethungra Hotel, Bethungra	14	1 April, 1932
St. Michael's Novitiate, Goulburn	5	26 ,, 1932
James Wilkins, Jerseyville, Muswellbrook	39	28 ,, 1932
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	205	29 ,, 1932
Tudor House School, Moss Vale	8	3 May, 1932
Australian Missionary College, Cooranbong	58	6 ,, 1932
Navua Ltd., Grose Wold, via Richmond (Jerseys)	16	13 ,, 1932
E. C. Nicholson, Jillamatong, Corowa	134	2 June, 1932
Grafton Experiment Farm (Ayrshires)	193	4 ,, 1932
Hurlstone Agricultural High School, Glenfield	53	9 ,, 1932
P. Ubrihien, Corridgeree, Bega	132	3 July, 1932
St. John's College, Woodlawn, Lismore	32	11 ,, 1932
Gladesville Mental Hospital	40	14 ,, 1932
William Thompson Masonic School, Baulkham Hills	45	16 ,, 1932
W. Hammond, Bellingen	68	16 ,, 1932
W. R. Boughton, Holbrook	22	27 ,, 1932
Chapman Bros., Farm 166, Stoney Point, Leeton	31	28 ,, 1932
Walter Burke, Bellefaire Stud Farm, Appin (Jerseys)	42	13 Aug., 1932
W. S. Turnbull, Flanders Avenue, Muswellbrook	32	14 ,, 1932
A. L. Logue, Thornbro, Muswellbrook	41	14 ,, 1932
E. E. Winder, Wybong Road, Muswellbrook	46	14 ,, 1932
A. Shaw, Barrington (Milking Shorthorns)	100	20 ,, 1932
A. H. Webb, Quarry-road, Ryde	4	24 ,, 1932
E. E. McMullen, Springbrook, Holbrook	32	25 ,, 1932
E. P. Perry, Nundorah, Parkville (Guernseys)	30	25 ,, 1932
Sacred Heart Convent, Bowral	10	26 ,, 1932
Department of Education, Gosford Farm Homes	38	2 Sept., 1932
James McCormack, Tumut	98	9 ,, 1932
Wagga Experiment Farm (Jerseys)	64	16 ,, 1932
S. L. Wills, Greendale Dairy, Cowra	31	16 ,, 1932
H. W. Burton Bradley, Sherwood Farm, Moorland (Jerseys)	67	6 ,, 1932
St. Patrick's College, Goulburn	7	21 ,, 1932
E. S. Cameron, Big Plain, Narrandera	31	26 Oct., 1932
Riverstone Meat Co., Riverstone Meat Works, Riverstone	99	29 ,, 1932

—MAX HENRY, Chief Veterinary Surgeon.

Farm Forestry.

V. THE NATIVE AND INTRODUCED TREES OF NEW SOUTH WALES.

[Continued from page 794.]

R. H ANDERSON, B.Sc.Agr., Assistant Botanist, Botanic Gardens, Sydney, and Lecturer in Forestry, University of Sydney.

THE COASTAL DIVISION—*continued.*

Introduced Trees of the Coastal Division.

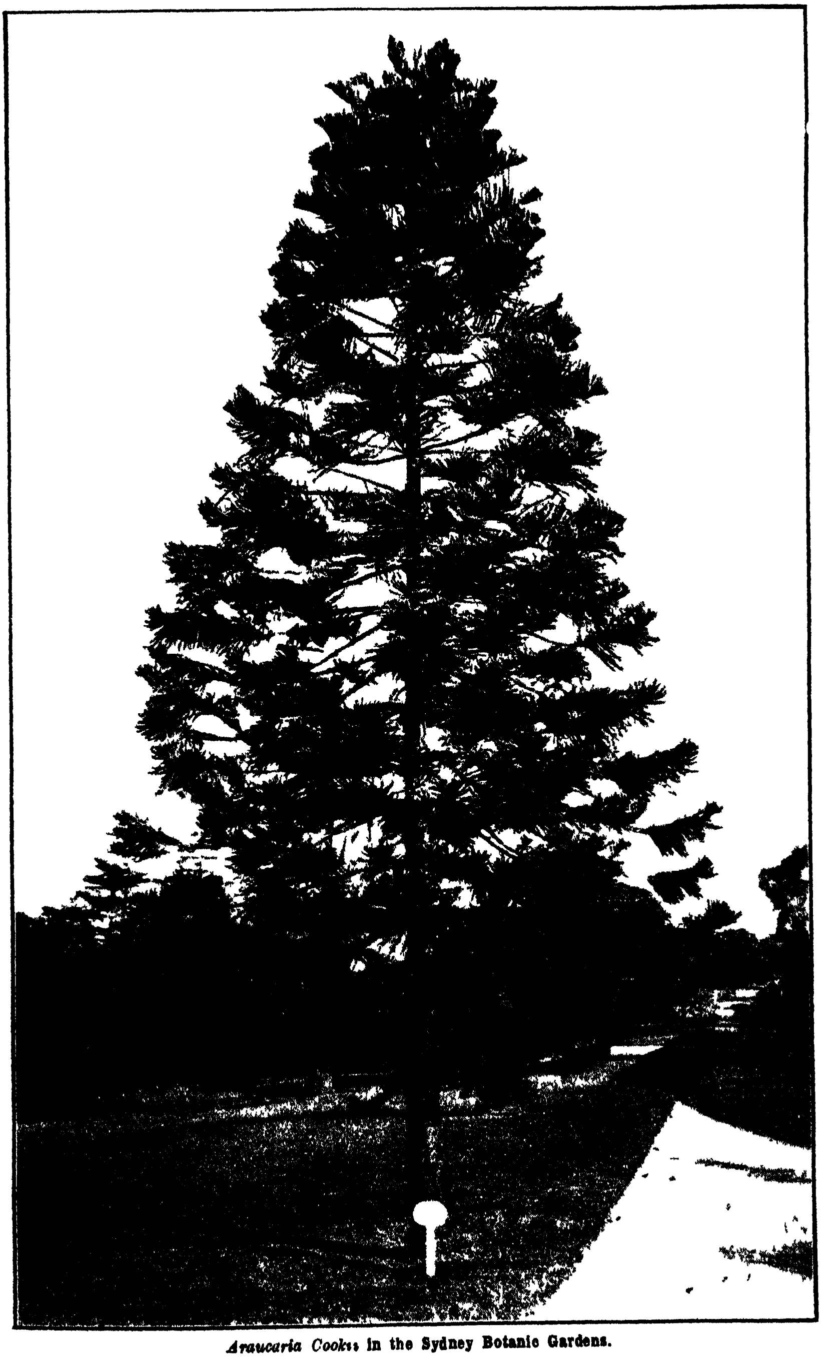
MANY countries have united to provide the Division with an interesting and varied tree flora. These trees from other lands possess both beauty and utility, and it would be of advantage to try out further introductions both in this Division and throughout the State. When selecting species for introduction it is reasonable to look to those countries the climatic conditions of which approximate our own, but the only real test of suitability is the actual growing of the tree in our State Some species, such as Insignis Pine, make relatively poor growth in their natural habitat and are without honor in their own country. When tested under our conditions, however, their growth is surprising Conversely, species which could reasonably be expected to do well here fail under actual growing tests.

The list of species dealt with in this article is by no means exhaustive, but covers those species most commonly met with and those which appear to be of greatest value.

NORFOLK ISLAND PINE (*Araucaria excelsa*).

This tree has been freely planted along the coastline of the Division, and is perhaps the most useful of all species for ornamental purposes and landscape work in sandy soil near the sea. It is a very symmetrical, tall-growing species, fairly rapid in growth, is able to thrive in practically pure sand, and is little affected by wind once the young plants have become established. The timber produced is valuable, and it would seem that this species is well worth experimenting with as a source of softwood supplies in this State. It is also a suitable species for growing as Christmas trees and for decorative work in tubs. In America it is largely grown for table and window decoration, the plants being usually raised from cuttings to give it a dwarf, compact appearance, with the tiers of the branches placed close together. When raised from seed it grows more rapidly, with much larger internodes between the whorls of branches.

The related species, *Araucaria Cookii,* is a native of New Caledonia, where it forms a slender, columnar tree up to 100 feet in height. It is occasionally cultivated in this State, being readily distinguished from the Norfolk Island Pine by the more slender, narrower outline, the closer, more irregular whorls of branches and the more drooping habit of the latter.



Araucaria Cookii in the Sydney Botanic Gardens.

The Monkey Puzzle, *Araucaria imbricata,* is only occasionally cultivated in the Division, and does not seem to do very well, appearing to be better adapted for parts of the Tableland Division. It is a striking tree, doing best on heavy loamy soils in sheltered sites, the branches being heavy and brittle and liable to breakage by wind. It is a native of the western slopes of the Andes in Chili, where its seeds constitutes one of the principal foods of the aborigines.

BUNYA PINE (*Araucaria Bidwilli*).

This species is a native of Queensland, but is not infrequently cultivated in many parts of the Coastal Division and elsewhere in the State. In its native habitat it reaches 140 feet in height, and under cultivation in this State forms a fairly large tree when conditions are favourable. It is a symmetrical tree with a narrow, dome-shaped crown, and produces very large cones up to 12 inches in length. The large seeds formed an important article of food for the aborigines, the ripening of the cones being the occasion for the holding of festivals. The timber is a useful one of the softwood class.

SWAMP CYPRESS OR BALD CYPRESS (*Taxodium distichum*).

A handsome, deciduous species with feathery foliage, which grows into a large tree with spreading head. It does best on moist, sandy loam, but makes fair growth in drier sites. It is a native of North America, where it forms large, handsome trees along rivers and near swamps, particularly over calcareous rocks. The soft, brown and light timber is easily worked, durable in the ground, and is used a good deal in general constructional work in America. It is a useful species for planting in the Coastal Division for shelter and ornamental purposes.

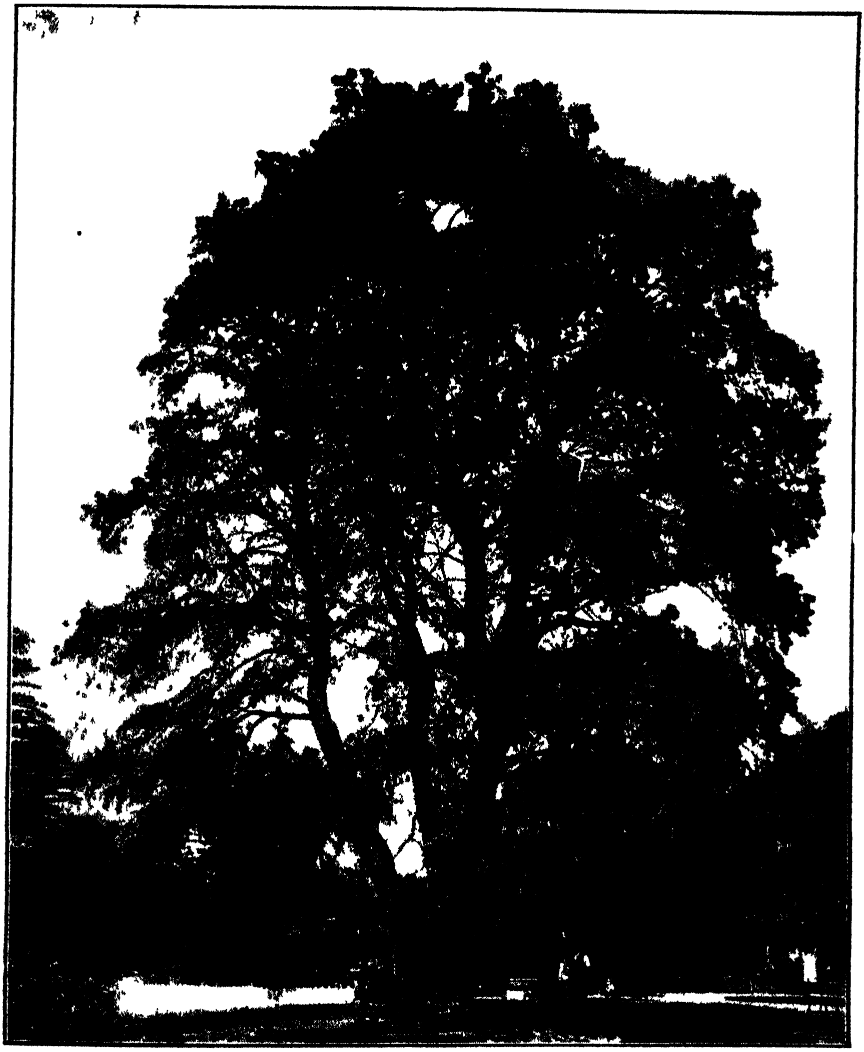
NEW ZEALAND CHRISTMAS TREE (*Metrosideros tomentosa*).

This is a handsome evergreen tree with somewhat spreading branches and dark-green foliage. It produces brilliant scarlet flowers which appear very attractive against the dark leaves. The species is a hardy one, making good growth in exposed situations near the sea, and is well worth planting in such situations. In New Zealand, in its natural habitat, it rarely grows far from the sea, and establishes itself in the most unlikely of places, often practically clinging to the sides of cliffs, the Maori name "Pohutukawa" meaning "spray-sprinkled," being very apt. The tree is grown here and there in the Coastal Division, some good specimens being present in the Sydney Botanic Gardens.

FIGS (*Ficus* spp.).

In addition to the native species which have already been dealt with (*Agricultural Gazette,* vol. XLI, page 521), a number of introduced Figs have been successfully grown in this State. At the Sydney Botanic Gardens quite a varied collection of species have been grown from time to time, but it is not proposed to enumerate these.

The Small-leaved Fig (*Ficus nitida*) is not uncommonly cultivated, and forms a handsome tree, useful for ornamental, shade and shelter purposes. The India-Rubber Tree (*Ficus elastica*) forms a good tree as far south as Sydney, but does best under semi-tropical conditions.



Swamp Cypress (*Taxodium distichum*).

The Weeping Fig (*Ficus Benjamina*), a native of the Malay Peninsula, is a beautiful species with graceful drooping branches, but requires a warm, moist climate, and is only recommended for the northern rivers. In warm, sheltered positions, however, it will grow as far south as Sydney. ***Ficus Hillii*** is a species which has been receiving a good deal of attention during recent years. It is a native of Queensland, and forms a very attractive, compact tree with rather small leaves. It is recommended for ornamental and avenue purposes and for shade and shelter

CORAL TREES (*Erythrina* spp.).

The most commonly planted species of Coral Tree in this State is *Erythrina corallodendron,* a native of the West Indies. It is a well-known tree, and largely planted in many parts of the Coastal Division for shelter and ornamental purposes. It is a deciduous species, and therefore particularly suitable for positions requiring shade in summer but free access of light and sun during the winter months. The scarlet flowers appear before the leaves and make a good show. The tree does well on a variety of sites, including sandy soils close to the sea.

A Specimen of *Ficus Hillii* in the Sydney Botanic Gardens.

Several other species of Coral Tree are also grown in the Division, including *Erythrina caffra* and *Erythrina speciosa,* the latter one being rather smaller growing than *Erythrina corallodendron.*

JACARANDA (*Jacaranda ovalifolia*).

As a specimen avenue tree, particularly in the northern subdivision, this deciduous species is difficult to surpass in beauty of flower and foliage. The blue flowers form a blaze of colour before the leaves appear, and the feathery, more or less fern-like foliage is itself very attractive. It stands pruning well, but is rather susceptible to frost in the early stages of growth, so needs some protection where frosts occur. The species is a native of Brazil.

CAPE CHESTNUT (*Calodendron capense*).

This handsome, evergreen species is well worthy of cultivation, forming a medium-sized tree which produces dense masses of white or flesh-coloured flowers in the spring. Propagation is secured both from seeds and cuttings. Its growth at times is rather slow, but if given attention it will develop quite rapidly and produce flowers in the fifth year. It is a native of South Africa.

KAFFIR PLUM (*Harpephyllum caffrum*).

This is an evergreen tree with leaves more or less aggregated at the ends of the branches, and with a dark-red fruit something like a large olive, and having a very thin pulp of a sub-acid taste. The tree is planted for ornamental and avenue work and for shelter purposes, and does quite well.

EUCALYPTS (*Eucalyptus* spp.).

A number of *Eucalyptus* species other than those found naturally are cultivated in the Division.

The Red-flowering Gum (*Eucalyptus ficifolia*), a native of Western Australia, is widely cultivated as an ornamental tree, and is most attractive when well grown. It is, however, a shallow-rooting species, and is very liable to be blown over by wind. It is desirable, therefore, to plant it only in sheltered positions.

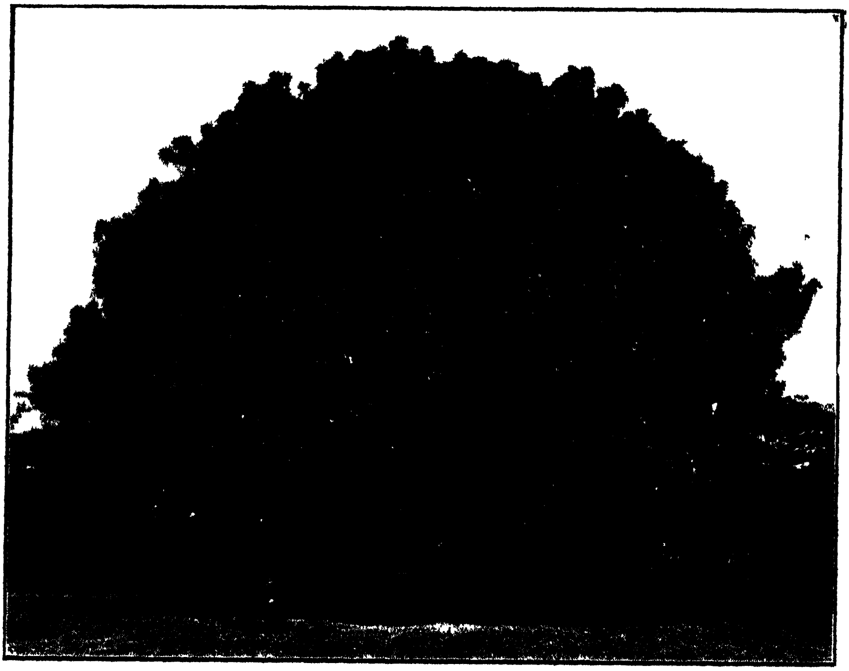
The Lemon-scented Gum (*Eucalyptus citriodora*), a native of Queensland, does well in the Division, forming a clean, straight-stemmed, graceful tree suited for avenue work and ornamental purposes, but rather too sparsely foliaged for shelter work.

The Tasmanian Blue Gum (*Eucalyptus globulus*) makes its customary rapid growth, and does well in many parts of the Division, particularly in the southern and central subdivisions. If kept cut back it can be made to produce its striking juvenile foliage for quite a number of years. The allied species, "Eurrabie" (*Eucalyptus bicostata*) also makes good growth and can be used effectively for avenue work and general purposes.

The Sugar Gum (*Eucalyptus cladocalyx*) forms some fine trees in the southern and central subdivisions, although not really suited for a moist climate.

OTHER TREES.

A number of pines have been successfully grown in the Division, the more common ones being Insignis Pine, Stone Pine, Cluster Pine, *Pinus longifolia, Pinus palustris,* and *Pinus laricio.* (See *Agricultural Gazette,* January, 1929, for full details.)



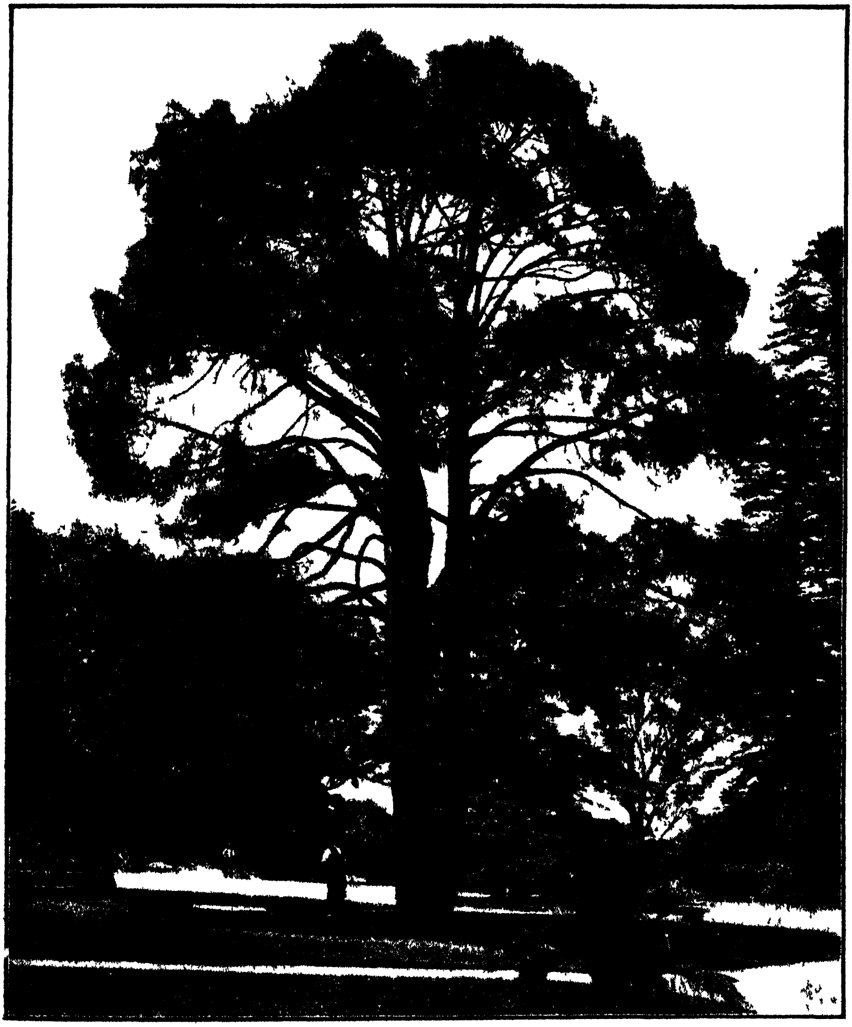
Kaffir Plum (*Harpephyllum caffrum*).

The Balsam of Peru (*Myroxylon Pereirae*) forms a very handsome tree with graceful drooping branches, and is recommended for ornamental and shade purposes. It is partially deciduous. The Camphor Laurel is generally useful, although rather slow growing. (See *Agricultural Gazette,* April, 1929.)

The European Nettle Tree (*Celtis australis*) is an attractive deciduous species with spreading, shapely head, and somewhat pendulous branchlets. It does not appear to be particular as to soil requirements, and is fairly vigorous in growth. It is a native of the Mediterranean regions, and has a sweet purple fruit a little more than ½-inch long. (See *Agricultural Gazette,* January, 1930.) The Carob Bean (*Ceratonia siliqua*) makes good growth in the Division. (See *Agricultural Gazette,* April, 1929.)

Some nice specimens of the Soap-berry Tree (*Sapindus Makurossi* var. *carinatus*) are occasionally seen. This tree is of spreading habit, with slightly pendulous branches.

Some fine specimens of several *Agathis* species may be seen in the Sydney Botanic Gardens, indicating that these species are suitable for the Division.



Long-leaved Pine (*Pinus longifolia*).

The New Caledonian Kauri Pines (*Agathis Moorei* and *Agathis ovata*) make good growth, and are decidedly attractive. The Fijian Kauri (*Agathis vitiensis*) also forms a nice tree, but requires semi-tropical conditions for its best development.

The Plum-fruited Yew (*Prumnopitys elegans*) forms a fair-sized bushy, rather dense tree with narrow leaves and a damson-like fruit. It appears to be fairly hardy, and is worth planting for ornament and shelter. The Tulip Tree and Sweet Gum, although seen to best advantage on the tablelands, both form handsome trees, and are worthy of further planting. (See *Agricultural Gazette*, January, 1930.)

The Chinese Privet (*Ligustrum lucidum*) is hardy and useful for hedges, small breakwinds, and small shelter trees, and the Olive (*Olea europea*) may be similarly employed. The Canary Island Palm (*Phoenix canariensis*), in addition to its use for ornamental purposes, can be employed for shade and shelter. as its wide-spreading fronds are soon lifted away from the ground.

The various species of oaks, poplars, and willows are dealt with in detail in the *Agricultural Gazette* for December, 1929, and the cypresses, elms, and junipers in the issue for January, 1930.

SPECIES RECOMMENDED FOR THE COASTAL DIVISION.

The recommendations given hereunder are only general ones, and it is often an advantage to seek personal advice for particular districts and for special purposes. They are not to be regarded as exhaustive, since a number of trees not listed are of considerable utility.

Trees for Shade and Shelter.

Brush Box (*Tristania conferta*).
Apple (*Angophora intermedia*).
Teak (*Flindersia australis*).
Black Bean (*Castanospermum australe*).
Wheel Tree (*Stenocarpus sinuatus*).
Tulip (*Harpullia pendula*).
Rosewood (*Dysoxylon fraserianum*).
Tallow Wood (*Eucalyptus microcorys*).
Swamp Mahogany (*Eucalyptus robusta*). Suited for brackish or poorly-drained soils.
Bangalay (*Eucalyptus botryoides*). Suited for brackish or poorly-drained soils.
Blue Gum (*Eucalyptus saligna*).
Ironbark (*Eucalyptus paniculata*).
Spotted Gum (*Eucalyptus maculata*).
Yellow Box (*Eucalyptus melliodora*).
Yellow Bloodwood (*Eucalyptus eximia*). On poor rocky sandstone soils.
Cedar Wattle (*Acacia elata*).
Figs (*Ficus* spp.).
Flame Tree (*Brachychiton acerifolius*). Deciduous.
Coral Tree (*Erythrina corallodendron*). Deciduous.

Department of Agriculture, N.S.W.—High Class Stud Dairy Cattle For Sale.

RICHMOND NERINE'S GEM (Vol 15)

[Stationed at Hawkesbury Agricultural College]

THE following are the herd-testing records of some of the cows in Departmental herds —Jersey Cow Wagga Gladys (7778) This cow holds a world's record for butter production for the Jersey breed—20,835 lb. milk, 1,384 80 lb. commercial butter in 365 days. Awarded Champion Ribbon, Peter's Prize, R. A. Show, 1928. Guernsey Cow. Wollongbar Parson's Red Rose 20th (730) Holds a world's record for butter production for the Guernsey breed—17,252 5 lb. milk, 1,302 62 lb commercial butter in 365 days. Ayrshire Cow · Miss Dot of Glen Innes (3760)—19,562 5 lb. milk; 1,088 64 lb. commercial butter in 365 days.

Heifers and bulls of proved producing lines of the following breeds are available for sale·—

MILKING SHORTHORN. JERSEY. GUERNSEY. AYRSHIRE.

For further particulars apply to—The UNDER SECRETARY, Department of Agriculture, Sydney.

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WHEAT will be received on account of growers, millers, shippers, and others, at the following stations:—

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Bogan Gate
Boorowa
Boree Creek
Bribbaree
Brocklesby
Brushwood
Buddigower
Burrumbuttock
Calleen
Canowindra
Caragabal
Combaning
Coolamon
Culcairn
Cumnock
Cullivel
Cunningar
Curban
Erigolia
Eugowra
Eumungerie
Finley
Forbes
Ganmain
Garema
Geurie
Gidginbung
Gilgandra
Girral
Gooloogong North
Goonumbla
Greenethorpe
Grenfell
Grong Grong
Gunningbland
Harefield
Henty
Holbrook
Hopefield
Illabo
Kamarah
Ladysmith
Lockhart
Maimuru
Mangoplah
Manildra
Marinna
Marrar
Matong
Milbrulong
Milvale
Mirrool
Molong
Moombooldool
Munyabla
Narromine
Nelungaloo
Oaklands
Old Junee
Parkes
Peak Hill
Pucawan
Quandary
Quandialla
Rand
Reefton
Stockinbingal
Tallimba
Temora
The Rock
Tichborne
Tomingley West
Tootool
Trundle
Tullibigeal
Urana
Urangeline
Uranquinty
Ungarie
Walla Walla
Wallendbeen
Wattamondara
Weethalle
Wellington
Wirrinya
Woodstock
Wyalong
Wyanga
Yeoval
Yerong Creek
Yiddah

NEW plants will be in operation at Belfrayden, Cunningar, Gooloogong North, Ladysmith, Quandary, and Woodstock.

GROWERS should patronise the system which has been provided in their interests to enable them to effect considerable savings in the cost of handling their wheat, to ensure safe storage, and to eliminate the necessity for purchasing cornsacks.

WHEAT may be delivered from clean second-hand cornsacks.

GROWERS at non-silo stations should consign their wheat in bulk trucks to the Terminal Elevator, Rozelle, at a reduced fee.

Inquiries are Invited.

2nd Floor, Department of Agriculture,
Raphael Street, Sydney.
Postal Address:
Box 36A, G.P.O., Sydney.

E. HARRIS,
Wheat Commissioner and
Manager, Govt. Grain Elevators.

Red Cedar (*Cedrela australis*). Deciduous.
White Cedar (*Melia Azedarach*). Deciduous.
Jacaranda (*Jacaranda ovalifolia*). Deciduous.
Cape Chestnut (*Calodendron capense*).
Lillipilli (*Eugenia Smithii*).
Weeping Lillipilli (*Eugenia Ventenatii*).
Camphor Laurel (*Cinnamomum camphora*).
Tea Tree (*Melaleuca leucadendron* and *Melaleuca styphelioides*). Suited to brackish or poorly-drained soils.
Turpentine (*Syncarpia laurifolia*).
Wattles (*Acacia* spp.).
Smooth-barked Apple (*Angophora lanceolata*). On poor rocky sandstone soils.
Insignis Pine (*Pinus radiata*).
Live Oak (*Quercus virginiana*).

Trees for Windbreaks and Shelter Belts.

Group I (Smaller-growing species to be used for small breaks, or in association with taller species in multiple-row breaks):—

Queensland Nut (*Macadamia ternifolia*).
Olive (*Olea europea*).
Camphor Laurel (*Cinnamomum camphora*).
Tulip (*Harpullia pendula*).
Lemon-scented Backhousia (*Backhousia citriodora*).
Carob (*Ceratonia siliqua*).
New Zealand Christmas Bush (*Metrosideros tomentosa*).
Lillipilli (*Eugenia Smithii*). Subject to wax scale.
Weeping Lillipilli (*Eugenia Ventenatti*). Subject to wax scale.
Pittosporum (*Pittosporum undulatum*). Subject to wax scale.
Magnolia (*Magnolia grandiflora*).
Turpentine (*Syncarpia laurifolia*). Can be cut back as a tall hedge.
Chinese Privet (*Ligustrum lucidum*).
Cypresses (*Cupressus* spp.).
Wattles (*Acacia* spp.).

Group II (Taller-growing species)—

Insignis Pine (*Pinus radiata*).
Cluster Pine (*Pinus pinaster*).
Turpentine (*Syncarpia laurifolia*).
Brown Pine (*Podocarpus elata*).
Wheel Tree (*Stenocarpus sinuatus*).
Silky Oak (*Grevillea robusta*).
Teak (*Flindersia australis*).
Kaffir Plum (*Harpephyllum caffrum*).
Black Bean (*Castanospermum australe*).

Tallow Wood (*Eucalyptus microcorys*).
Blackbutt (*Eucalyptus pilularis*).
Blue Gum (*Eucalyptus saligna*).
Ironbark (*Eucalyptus paniculata*).
Swamp Mahogany (*Eucalyptus robusta*). Suited for brackish or poorly-drained soils.
Pink-flowering Ironbark (*Eucalyptus sideroxylon*).
Woolly Butt (*Eucalyptus longifolia*).
Bangalay (*Eucalyptus botryoides*).
Tea Tree (*Melaleuca leucadendron* and *Melaleuca styphelioides*).

Hardwood Timber Trees.

Stringybarks (*Eucalyptus eugenioides* and *Eucalyptus Muelleriana*). On sedimentary soils.
White Mahogany (*Eucalyptus acmenioides*). On fairly good moist soils in northern portion.
Ironbark (*Eucalyptus paniculata*). Various soils except poor sandy types.
Narrow-leaf Ironbark (*Eucalyptus crebra*). On moderately good soils.
Blue Gum (*Eucalyptus saligna*). On fairly deep soils.
Tallow Wood (*Eucalyptus microcorys*). Good, deep, fairly moist soil.
Blackbutt (*Eucalyptus pilularis*). Various soils.
Grey Gum (*Eucalyptus punctata*). Rather poor siliceous soils.
Bloodwood (*Eucalyptus corymbosa*). On poor sandy soils for fencing purposes.
Red Mahogany (*Eucalyptus resinifera*). Various soils, except poor sandy types.

Softwood Timber Trees.

Hoop Pine (*Araucaria Cunninghamii*).
Norfolk Island Pine (*Araucaria excelsa*).
Brown Pine (*Podocarpus elata*).
Insignis Pine (*Pinus radiata*).
Cluster Pine (*Pinus pinaster*).
Coachwood (*Ceratopetalum apetalum*). Not a true softwood species, but useful as a light timber.

(*Concluded.*)

"THE INTERNATIONAL CATTLE ATLAS."

THE International Institute of Agriculture, Rome, has just published the first volume of "The International Cattle Atlas." This particular volume deals with Hungary, and is valuable as a contribution to research on zootechnical geography. It contains a diagram showing the distribution of cattle strains, a complete monograph of information on the general conditions of rearing, and an accurate description of the strains bred in Hungary.

Our copy from the International Institute of Agriculture.

The Effects of Lime-sulphur and White Oil Sprays on Jonathan Apple Trees.

EXPERIMENTS AT BATHURST EXPERIMENT FARM.

C. G. SAVAGE, R.D.A., Director of Fruit Culture, and J. A. BALLANTYNE,
Orchardist, Bathurst Experiment Farm.

Two experiments were carried out at Bathurst Experiment Farm last season to test the effects of sprays on Jonathan apple trees; one concerned the damage that was likely to occur to the trees and fruit as the result of applications of lime-sulphur and miscible white oil in conjunction with arsenate of lead, and the other the effect of lime-sulphur on the shedding of fruit after petal fall and on the occurrence of russeting.

Lime-sulphur and Miscible White Oil used in Conjunction wtih Arsenate of Lead.

The addition of white spraying oils to the arsenate of lead applications has been proved to be of great advantage in controlling codling moth, while the application of lime-sulphur is essential for combating powdery mildew and black spot of apple in many districts. However, damage to the fruit and trees has been reported where sulphur compounds have been applied, either combined with or following soon after the application of oil sprays, and the practice of mixing lime-sulphur or miscible oil sprays with arsenate of lead has been said to be responsible for causing the fruit to show a dull and russeted appearance. To gain the fullest advantage from these sprays it is essential that the periods at which the lime-sulphur and oil can be applied without damage resulting to the fruit and trees be ascertained.

An experiment was designed to obtain these data in relation to Jonathan apples in the Bathurst district last season, five trees being included in each test.

Table I shows the spraying programmes carried out on a number of plots. and records the data collected in connected with spray injury, russeting, and codling moth infestations. In addition a close watch was kept throughout the season as to the blossoming of the trees, the setting of the fruit, and the general condition of the trees.

All the trees excepting those in Tests Nos. 7 and 8 blossomed well and set good crops. In comparing the crops harvested from the various plots, it would appear that there may have been a considerable " drop " of fruit in the early stages of development in plots 7 and 8. In the case of Test No. 8 a heavy "drop" did occur, but in Test No. 7 the drop was negligible. The main cause of the light crop in these two tests was probably the condition of the trees. In these two plots the trees are older than those in Tests Nos. 1 to 6; although the root stocks are of the same age as in Plots 7 and 8, these trees were grafted to Jonathan some years after planting, and consequently the fruiting wood is in a better condition.

The trees which received an application of lime-sulphur with the calyx spray showed a little burning, but not sufficient to do any material damage.

TABLE I.—Showing Spraying Programmes, Spray Injury, Russeting, and Codling Moth Infestation.

Test No.	Spray Treatment *	Date of Application	Bushels of Fruit.	Percentage of Spray Burn.	Percentage of Fruit Russeted	Percentage of Codling Moth Infestation.
1	1. Calyx, Arsenate of Lead ...	17–10–30	15½	3·38	16·12	3·67
	2. First Cover, Arsenate of Lead	3–11–30				
	3. Second Cover, Arsenate of Lead, plus White Oil A.	1–12–30				
	4. Third Cover, Arsenate of Lead, plus White Oil A.	19–12–30				
	5. Fourth Cover, Arsenate of Lead, plus White Oil A.	12–1–31				
2	1. Calyx, Arsenate of Lead ...	17–10–30	23	·32	30·43	6·08
	2. First Cover, Arsenate of Lead	3–11–30				
	3. Second Cover, Arsenate of Lead, plus White Oil B.	1–12–30				
	4. Third Cover, Arsenate of Lead, plus White Oil B.	19–12–30				
	5. Fourth Cover, Arsenate of Lead, plus White Oil B.	12–1–31				
3	1. Calyx, Arsenate of Lead ...	17–10–30	17	Nil.	29·41	12·44
	2. First Cover, Arsenate of Lead	3–11–30				
	3. Second Cover, Arsenate of Lead	1–12–30				
	4. Third Cover, Arsenate of Lead...	19–12–30				
	5. Fourth Cover, Arsenate of Lead	12–1–31				
4	1. Spurburst, Lime-sulphur ...	25–9–30	18	1·97	6·11	3·05
	2. Pinking, Lime-sulphur ...	30–9–30				
	3. Calyx, Arsenate of Lead, plus Lime-sulphur.	17–10–30				
	4. First Cover, Arsenate of Lead...	3–11–30				
	5. Second Cover, Arsenate of Lead, plus White Oil A.	1–12–30				
	6. Lime-sulphur	11–12–30				
	7. Third Cover, Arsenate of Lead, plus White Oil A.	20–12–30				
	8. Lime-sulphur	30–12–30				
	9. Fourth Cover, Arsenate of Lead, plus White Oil A.	12–1–31				
5	1. Spurburst, Lime-sulphur ...	25–9–30	17	2·38	2·05	4·0
	2. Pinking, Lime-sulphur ...	30–9–30				
	3. Calyx, Arsenate of Lead, plus Lime-sulphur.	17–10–30				
	4. First Cover, Arsenate of Lead...	3–11–30				
	5. Second Cover, Arsenate of Lead, plus White Oil B.	1–12–30				
	6. Lime-sulphur	11–12–30				
	7. Third Cover, Arsenate of Lead, plus White Oil B.	20–12–30				
	8. Lime-sulphur	30–12–30				
	9. Fourth Cover, Arsenate of Lead, plus White Oil B.	12–1–31				

* Arsenate of lead was used at rate of 24 oz. powder to 50 gallons water; lime-sulphur at spurburst and pinking sprays, 1 gallon to 14 gallons water, and at calyx and subsequent sprays 1 gallon to 35 gallons of water or arsenate of lead spray; miscible white oils at 1 gallon to 80 gallons water or arsenate of lead spray. Casein spreader was added to all sprays.

TABLE I.—Showing Spraying Programmes, Spray Injury, Russeting, and Codling Moth Infestation—*continued.*

Test No.	Spray Treatment.*	Date of Application.	Bushels of Fruit.	Percentage of Spray Burn	Percentage of Fruit Russeted.	Percentage of Codling Moth Infestation.
6	1. Spurburst, Lime-sulphur	25–9–30	26	Nil.	Nil.	5·31
	2. Pinking, Lime-sulphur	30–9–30				
	3. Calyx, Arsenate of Lead, plus Lime-sulphur.	17–10–30				
	4. First Cover, Arsenate of Lead, plus Lime-sulphur.	3–11–30				
	5. Second Cover, Arsenate of Lead, plus Lime-sulphur.	1–12–30				
	6. Third Cover, Arsenate of Lead, plus Lime-sulphur.	20–12–30				
	7. Fourth Cover, Arsenate of Lead, plus Lime-sulphur.	13–1–31				
7	1. Spurburst, Lime-sulphur	25–9–30	9½	6·1	12·47	·63
	2. Pinking, Lime-sulphur	30–9–30				
	3. Calyx, Arsenate of Lead, plus Lime-sulphur.	17–10–30				
	4. First Cover, Arsenate of Lead	3–11–30				
	5. Second Cover, Arsenate of Lead, plus White Oil A.	1–12–30				
	6. Lime-sulphur	6–12–30				
	7. Third Cover, Arsenate of Lead, plus White Oil A.	19–12–30				
	8. Lime-sulphur	24–12–30				
	9. Fourth Cover, Arsenate of Lead, plus White Oil A.	14–1–31				
	10. Lime-sulphur	19–1–31				
8	1. Spurburst, Lime-sulphur	25–9–30	3½	7·14	3·70	1·57
	2. Pinking, Lime-sulphur	30–9–30				
	3. Calyx. Arsenate of Lead, plus Lime-sulphur.	17–10–30				
	4. First Cover, Arsenate of Lead, plus Lime-sulphur.	3–11–30				
	5. White Oil A	8–11–30				
	6. Second Cover, Arsenate of Lead, plus Lime-sulphur.	6–12 30				
	7. White Oil A	Omitted.				
	8. Third Cover, Arsenate of Lead, plus Lime-sulphur.	19–12–30				
	9. White Oil A	24–12–30				
	10. Fourth Cover, Arsenate of Lead, plus Lime-sulphur.	14–1–31				
	11. White Oil A	19–1–31				

* Arsenate of lead was used at rate of 24 oz. powder to 50 gallons water, lime-sulphur at spurburst and pinking sprays, 1 gallon to 14 gallons water, and at calyx and subsequent sprays 1 gallon to 35 gallons of water or arsenate of lead spray; miscible white oils at 1 gallon to 80 gallons water or arsenate of lead spray. Casein spreader was added to all sprays.

Condition of Trees and Spray Burning.

Arsenate of Lead and White Miscible Oils (Tests Nos. 1 and 2).—Until 9th April no detrimental effect could be noted in the growth or general appearance of the trees. All trees showed a little leaf scorching, but not more than the trees in Plot 3, where arsenate of lead with casein spreader was applied. During April the trees were showing a discolouration of the wood, growth was retarded and early defoliation taking place, the cause of which was obviously a severe attack of "powdery mildew," as no preventive spray for this fungus had been applied.

At picking time the fruit appeared to be slightly "sleepy" and presented a rather dull, oily appearance, a fair amount of residue being present which caused spotting on the coloured skin.

The amounts of spray burn on the fruit of Tests 1 and 2 when harvested were 3.38 per cent. and .32 per cent. respectively.

Arsenate of Lead Sprays (Test No. 3).—These trees showed a small amount of leaf scorch. The growth appeared healthy until about the month of April, when the effects of the uncontrolled fungus of "powdery mildew" became apparent. The shoots became discoloured, growth ceased, and early defoliation followed. The fruit when harvested was of good colour, and although a fair amount of residue was present, the skin was practically free from any discolouration or spotting.

Combined Arsenate of Lead and Miscible Oil Sprays, preceded and followed at ten-day intervals by Lime-sulphur Applications (Tests Nos. 4 *and* 5).—The trees throughout the season remained healthy but for a very slight leaf burning which in no way appeared to affect the vigour of the trees, as they compared favourably with the trees in the other tests. No fruit or leaf drop resulted from the application of any of the sprays.

The fruit when harvested presented a "dead" appearance, and had failed to colour properly. The amount of residue upon the fruit was considerable. In Test No. 5, 60 per cent., and in Test No. 4, 80 per cent. of the fruit showed discoloured spots on the skin. The spray burn on the fruit was 1.97 per cent. in Test No. 4 and 2.38 per cent. in Test No. 5, which results compare favourably with Tests Nos. 1 and 2.

Arsenate of Lead and Lime-sulphur Sprays (Test No. 6).—All the trees made good growth, and with the exception of a slight amount of foliage burn were of healthy appearance throughout the year. When harvested, the fruit showed very little spray residue or spotting, was well coloured and attractive in appearance, and free from spray burn.

Arsenate of Lead and White Oil Sprays, preceded and followed at five-day intervals by Lime-sulphur Sprays (Test No. 7).—The trees up till 6th December appeared normal; on this day an application of lime-sulphur was made, five days only having elapsed since the second cover spray of arsenate of lead and oil had been applied. The trees appeared to take on a "lifeless" appearance and the fruit became very dull. No leaf fall occurred, though a slight burning of the foliage resulted. Following further applications of the sprays a slight leaf fall took place, though no fruit was shed. The trees made little growth throughout the season, and were very sickly in appearance.

When picked, 6.1 per cent. of the fruit was showing spray burns. The fruit carried a heavy spray residue, and spotting was recorded on 80 per cent. of the apples, which had a very "dead" appearance and did not colour or ripen satisfactorily.

Arsenate of Lead and Lime-sulphur Sprays, followed at five-day intervals by Oil Sprays (Test No. 8).—The first sign of damage occurred a few days after the first application of oil on 8th November. The leaves first showed burning and discolouration, the fruit appeared dull and lifeless. Later pronounced foliage injury resulted, the fruit turned yellow, and by 22nd November fully 75 per cent. of both fruit and foliage had fallen. Owing to the damage that resulted it was deemed inadvisable to apply a further application of oil after the second cover spray, which was delayed till 6th December.

By 24th December the trees had recovered sufficiently to warrant testing a further application of oil five days after the application of the arsenate of lead and lime-sulphur third cover spray. No further damage to the fruit occurred, but a slight leaf fall followed the oil spray on 24th December. The apples when gathered had coloured well, were of large size, but oily looking and appeared somewhat dull. The trees appeared to grow well towards the end of the season and are now apparently in good health.

Russeting of the Fruit.

In the early part of the season a great deal of russeting of the fruit was apparent in many of the plots. Details of the percentages of russeted fruit at the time of harvesting are given in Table I.

Tests 1, 2, *and* 3.—In Tests Nos. 1 and 2 applications of lime-sulphur were omitted, but miscible white oils were applied with the second, third, and fourth arsenate of lead cover sprays. It will be noted that the amounts of russeted fruit were 16.12 per cent. and 30.43 per cent. respectively. From these results the conclusion might be drawn that the popular contention that the addition of miscible spraying oil to the arsenate of lead spray caused russeting was correct, but that this is not necessarily so will be seen when the results are compared with those of Test No. 3, in which only arsenate of lead with casein spreader was applied, the amount of russeted fruit in this instance being 29.4 per cent.

The conclusion to be drawn from these results is that some agency other than miscible spraying oils, causes the russeting of the apples.

Tests Nos. 4 *and* 5.—In these trials lime-sulphur was applied both at spurburst and pinking stages and a further application of the fungicide was made with the calyx spray of arsenate of lead. Miscible oils were applied with the second, third and fourth arsenate of lead cover sprays, and lime-sulphur sprays were applied ten days after the second and third cover sprays. The amounts of russeted fruit when harvested were 6.11 per cent. and 2.05 per cent. respectively, suggesting that the russeting was reduced by applications of lime-sulphur. It is known that the fungus *Coniothecium chomatosporum* causes the russeting of apples, but so far the organism has not been isolated from russeted apples in New South Wales. Russeting may also result from spraying with Bordeaux mixture, and from low temperatures occurring during the growing period of the fruit.

Test No. 6.—The results from this trial, where lime-sulphur applications were given at spurburst and pinking stages and with the calyx and four cover sprays of arsenate of lead, add further colour to foregoing suggestion that sprays of lime-sulphur tend to reduce the amount of russeting upon apples. Further investigations may reveal that under certain conditions the russeting is due to an organism which can be controlled by the application of lime-sulphur sprays.

Test No. 7.—Though lime-sulphur was applied at the spurburst and pinking stages and with the calyx and first arsenate of lead cover sprays, and again five days after the second, third and fourth arsenate of lead cover sprays to which miscible white spraying oils had been added, the amount of russeted fruit recorded was 12.4 per cent. This amount is much less than that recorded in the tests where lime-sulphur was omitted, again suggesting that lime-sulphur assisted in the control of russet.

Test No. 8.—In this plot seven applications of lime-sulphur were given and the amount of russeted fruit recorded at harvest was 8.70 per cent. This figure is not comparable because of the damage that occurred after white miscible spraying oil had been applied five days after the arsenate of lead and lime-sulphur spray on 3rd November.

Though the russeting of apples was controlled by applications of lime-sulphur sprays, the fact must not be lost sight of that the trees so treated were practically free of powdery mildew (*Podosphaera oxycanthae*). The trees which did not receive lime-sulphur sprays were more or less severely attacked by the powdery mildew fungus. The vitality of these trees was reduced by the attack of the fungus, and this may have rendered them more susceptible to attack by fungi which cause russeting and also more liable to be affected by rapid falls in the air temperature.

Codling Moth Infestation.

Though these experiments were not planned for the control of codling moth, the results are none the less interesting. It will be noticed that the highest infestation of the moth occurred where arsenate of lead was used without the addition of either white miscible spraying oils or lime-sulphur. The best control appears to follow when white oil sprays are applied ten days after the arsenate of lead and lime-sulphur cover sprays, or lime-sulphur applications are applied ten days after the arsenate of lead and white oil cover sprays.

THE EFFECT OF LIME-SULPHUR ON SHEDDING AND RUSSETING.

This experiment was planned to observe whether the shedding of fruit after petal fall was greater when trees were sprayed with lime-sulphur at pinking stage than when they were not sprayed with lime-sulphur, and to note the effect of the lime-sulphur applications upon the control of russeting of the fruit.

Three tests were carried out with ten Jonathan apples trees in each plot; details of the treatments and the results obtained are tabulated in Table II.

TABLE II.—Showing Influence of Lime-sulphur Sprays on Russeting.

Test No.	Spray Treatment.*	Bushels of Fruit.	Percentage of Fruit Russeted.	Remarks.
1	Lime-sulphur (1 gallon to 14 gallons water) at pinking stage, and lime-sulphur (1 gallon to 35 gallons water) at calyx stage.	65½	·78	Very little russeting.
2	Lime-sulphur (1 gallon to 35 gallons water) at calyx stage.	42	19	Fair amount of russeting.
3	Not sprayed with lime-sulphur ...	35¼	70	Heavy russeting, 25 per cent. of the crop being unmarketable.

* NOTE.—All trees received one calyx and four cover sprays of arsenate of lead powder and casein spreader. In Tests Nos. 1 and 2 the lime-sulphur was mixed and applied with the arsenate of lead at calyx stage.

Shedding of Fruit.

All the trees blossomed profusely and appeared to set the fruit equally well. The difference in the yields is due to the size of the tree, those in Test No. 1 being larger than those in the other two tests, while those in Test No. 3 are smaller than those in Test No. 2.

Following the application of each of the lime-sulphur sprays a little foliage damage was noted, but the burning was not sufficient to effect the blossoming or "set" of fruit. The shedding in all three plots appeared to be equal, as was also the period over which shedding took place. The trees in the three trials made good growth and remained healthy throughout the season.

Russeting.

From the table it will be seen that where lime-sulphur sprays were applied a definite reduction of russeting was recorded. A better control of russet was obtained where both the pinking and calyx sprays were given than where the pinking stage was omitted.

SUMMARY.

In considering the results of these experiments the fact must be borne in mind that the tests have only been carried out over one year. Though they must be received with a certain amount of caution, the results in some directions have been very consistent, and therefore may be taken as having a bearing on what may be expected when similar sprays are applied in the Bathurst and other districts of similar climate.

Definite damage resulted both to the tree and fruit when white miscible spraying oils and lime-sulphur sprays were applied within five days of each other. When the period between the applications was extended to ten days, no damage was apparent. The tests are being continued to ascertain whether there is a cumulative effect when similar sprays are applied to the same trees over a number of years.

The applications of lime-sulphur definitely assisted in controlling russeting on Jonathan apples. The best control was obtained where the sprays were applied at spurburst, pinking, and added to the calyx and cover sprays of arsenate of lead. The results indicate that the russeting of the Jonathan apples at Bathurst in the 1930-31 season was due to some organism that was controlled by the applications of lime-sulphur and was not due to spray injury or low temperatures.

Codling moth was controlled to a greater degree where white miscible oil or lime-sulphur was added to the cover sprays of arsenate of lead than where neither was included.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under-Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the price for the seeds mentioned hereunder. In the event of purchasers being dissatisfied with seed supplied by growers whose names appear on this *list*, they are requested to report immediately to the Department.

Pure seed growers are required to furnish each month a statement of the quantity of seed on hand. Such statement must reach the Department, Box 36a, G.P.O., Sydney, not later than the 12th of the month.

Maize—	
Fitzroy	Manager, Experiment Farm, Grafton.
Sorghum—	
Sumac	Principal, Hawkesbury Agricultural College, Richmond.
Tomatoes—	
Bonny Best	Manager, Experiment Farm, Bathurst.
Marglobe	Manager, Experiment Farm, Bathurst.
Sweet Potatoes (cuttings only)—	
Vineless	S. Redgrove, Sandhills, Branxton.
Nancy Hall	
Yellow Strassburg	
Porto Rico	
Brooks' Seedling No. 3	
Director	
Pierson	
Sudan Grass	Manager, Experiment Farm, Bathurst. Manager, Experiment Farm, Nyngan. Manager, Experiment Farm, Condobolin.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

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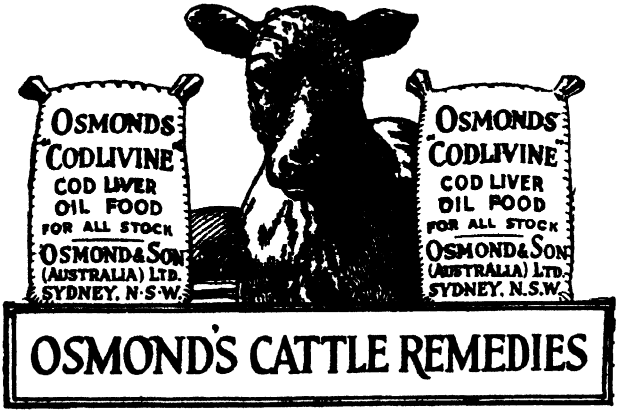

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G. D. ROSS, Under Secretary,
Department of Agriculture,
SYDNEY.

Codling Moth Experiments, 1930-31.

RESULTS OBTAINED AT BATHURST EXPERIMENT FARM.

[Continued from page 816.]

S. L. ALLMAN, B.Sc.Agr., M.S., Assistant Entomologist.

THE first portion of this article, which concerns a series of experiments designed to obtain a spray programme giving maximum control of the codling moth without excessive arsenical residue, discussed certain field experiments. In this portion it is proposed to deal with field demonstrations of the controls and certain other aspects.

Field Demonstration of Controls.

In addition to the experimental tests, a number of treatments have been tested during the past two seasons on a variety block. The demonstrations were planned and carried out in conjunction with the orchardist, Mr. J. A. Ballantyne. All plots received the calyx spray of lead arsenate (3 lb. powder to 110 gallons of water), and all cover sprays had casein-lime (1 lb. to 110 gallons of water) added.

The following list gives the detailed treatments subsequent to the common calyx spray:—

1. Lead arsenate powder, 3 lb. to 110 gallons water—Five cover applications.
2. Lead arsenate powder, 3 lb. to 110 gallons water, plus lime-sulphur, 1 in 35—Five cover applications.
3. Lead arsenate powder, 3 lb. to 110 gallons water, plus white oil (A), 9 pints—Five cover applications.
4. Lead arsenate powder, 3 lb. to 110 gallons water, plus white oil (B), 9 pints—Five cover applications.
5. Lead arsenate powder, 3 lb. to 110 gallons water.—Three cover applications; white oil (B), 9 pints to 110 gallons—Two further cover applications.
6. Lead arsenate powder, 3 lb. to 110 gallons water—Two cover applications; white oil (B), 9 pints to 110 gallons—Three further cover applications.
7. Lead arsenate powder, 3 lb. to 110 gallons water, plus white oil (C), 9 pints—Three cover applications; white oil (C), 9 pints to 110 gallons—Two further cover applications.

In the 1930-31 tests white oil (A) had to be used in place of white oil (B), but as both are manufactured by the one firm and as the viscosities of the two oils are not widely different (they represent adjacent grades), little change should have resulted. Treatment No. 7, using white oil (C), was substituted for treatment No. 4 used in the previous season's tests; the result of each of these two plots is therefore available for the one year only.

The main varieties included were William's Favourite, Cleopatra, Huon Pearmain, Senator, Gano, Staymans, Kentucky Red Streak, Statesman, and Delicious.

The results of the two seasons' experiments are set out in the following table:—

RESULTS of Field Demonstrations.

Treatment.*	1929-30.		1930-31.	
	Cases Fruit harvested	Per cent. Infested Fruit.	Cases Fruit harvested.	Per cent. Infested Fruit.
1	20	10·9	81	10·3
2	34	7·1	98	7·5
3	71	2·3.	24	4·8
4	50	7·9	...	...
5	51	11·0	62	11·0
6	55	8·7	49	12·0
7	...	...	88	3·5

*The figures in this column refer to the detailed list on page 955.

From the above table the following conclusions may be drawn:—

(1) The use of white oil in combination with lead arsenate has exercised the most efficient control. (See Treatment No. 3.)

(2) Where white oil alone was used after two or three applications of lead arsenate alone (treatments Nos. 5 and 6) the control was less efficient than in Treatment No. 3.

(3) Where three cover sprays of lead arsenate and white oil, combined, were used, followed by two covers of white oil alone (see Treatment No. 7), very satisfactory results were obtained for the one season under test.

(4) The application of lime-sulphur in all cover sprays (see Treatment No. 2) has resulted in a marked lowering of infestation in comparison with the lead arsenate plot. (See Treatment No. 1.)

Spray Injuries.

Only the Huon Pearmain and Mountain Pippin varieties were injured in any manner by the continued use of oil throughout the season. This injury was only a slight burning about the calyx end and did not affect the grade of the fruit.

The Experiment and Demonstration Plots Compared.

The demonstration plots, each of approximately 1 acre in area, have confirmed the finding of the smaller scale experiments.

Absolute confirmation has been forthcoming that the application of a white oil emulsion in conjunction with lead arsenate has materially increased the effectiveness in codling moth control over and above that of the latter insecticide alone.

The same holds true, but to a lesser degree, with lime-sulphur. The use of casein-lime spreader is very necessary with this mixture to minimise the reaction between the lead arsenate and lime-sulphur. This type of spray is in common use in districts where black spot is prevalent, and suggests one reason why the ravages of the codling moth appear to be so much lessened in such districts.

Chemical Treatment of Bandages.

In the series of field experiments described in the previous section of this article in the October issue, various oils under test proved to be highly toxic to codling moth larvae, but were also found to cause severe injury to the tree trunk. Trunks bandaged late in 1928 remained apparently sound until the beginning of this present season. The majority of the trees are now almost completely ringbarked, following a six-weeks' exposure to oil in 1928. Fig. 5 shows the trunk of one of these trees, together with one method of grafting carried out to overcome this injury.

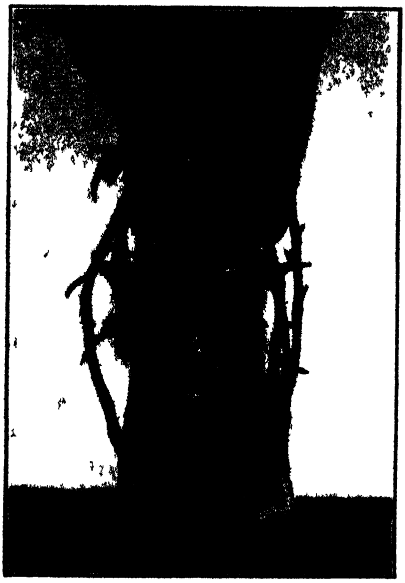

Fig. 5.—Damage caused by Bandages saturated in Mineral Oil in tests to destroy Codling Moth Grubs, and one method adopted to correct the condition.

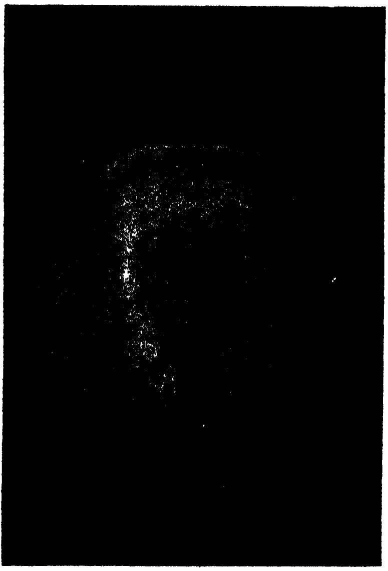

Fig. 6.—Small Russeted Areas on Apples, following the use of Tar Distillate combined with Lead Arsenate as a Cover Spray.

The use of oil bandages is therefore not to be recommended at this stage, though, of course, the use of ordinary, untreated bandages, and the regular destruction of codling grubs thereunder every fourteen days is recommended.

Laboratory Tests of Ovicides.

A small number of ovicides were tested by pinning leaves on which eggs had been deposited to flat pieces of cork, and spraying them with a hand atomiser. Considerable difficulty was experienced in obtaining an adequate supply of eggs, and the tests had to be curtailed.

The following table gives the results of the various treatments each of which is followed by the untreated check for comparison.

RESULTS of Ovicide Tests.

Treatment.	Number of eggs.	Number hatched.	Number dead.	Percentage of mortality.
White oil (A), 1 part in 100 parts water	42	8	34	80·95
Special white oil (B), 1 part in 100 parts water ...	52	1	51	98·08
Check (untreated)	34	28	4	11·76
Nicotine sulphate, 1 part in 800 parts water, plus tannic acid 3 lb. per 100 gallons water ...	30	20	10	33·33
Check (untreated)	27	27	nil.	0·00
Tar distillate, 1 part in 80 parts water	30	29	1	3·33
Check (untreated)	27	24	3	11·11
Pyrethrum derivative, 1 part in 600 parts water	20	18	2	10·00
Check (untreated)	14	12	2	14·29

The special oil (B) having an incorporated contact insecticide proved to be much more efficient than the ordinary white oil at a similar concentration.

Comparative Brood Records of Bathurst and Batlow Strains of Codling Moth.

During the past season a laboratory test was carried out which was designed for the purpose of finding out whether the comparative ease of control at Batlow was correlated with the number of broods of the codling moth or with some environmental condition or was possibly due to a more effective spray programme. Mr. E. C. Whittaker, Fruit Inspector, of Batlow, provided the necessary material for this work, and he also carried out the brood records of the moth under Batlow conditions.

The sequence of broods under both Batlow and Bathurst conditions is shown in a graph (Fig. 7). It is quite evident that little significant variation exists between the Bathurst and Batlow strains, even when the latter is bred under Bathurst conditions. The periods of peak emergence of both strains have been almost simultaneous and consequently suggest that some other factor must be operating in the Batlow district to help keep the moth in better control than is possible at Bathurst.

A partial second brood of moths was obtained both under Bathurst and Batlow conditions, but owing to the small numbers obtained it was found impossible to carry on and breed a supply of third brood larvae.

During the past season colour variations of the adult moth have appeared for the first time in the breeding extending over five years. Two light-coppery individuals, one male and the other female, were bred, differing very noticeably from the normal dark-grey forms. The first was taken in Batlow and the second in Bathurst material and probably resulted from some abnormal condition in the insectary.

Summary.

Field Experiments.—Six applications of lead arsenate resulted in 27.53 per cent. infestation; four sprayings at the same strength, 39.95 per cent., and the control (untreated) plot showed 78.86 per cent. infestation.

The combination of white oil emulsion and lead arsenate proved to be most efficient in control.

The use of lime-sulphur in all five cover sprays gave very satisfactory results.

Of the non-arsenicals tried, the combination of white oil emulsion and nicotine sulphate was found to exercise most control.

Dusting with lead arsenate powder, at the rates previously specified, compared favourably with the liquid spray.

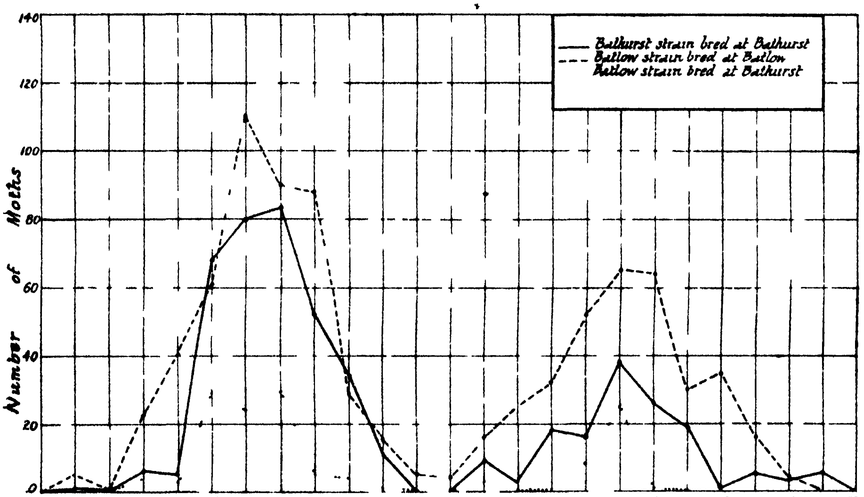

Fig. 7.—Graph showing Emergence of Moths of the spring and first broods at Bathurst and Batlow, 1930–31.

Reduction in the number of applications reduced the control.

The use of casein-lime spreader with the lead arsenate gave slightly better control.

The various white oils and other emulsions tested gave inferior results when used alone.

The mixture of nicotine sulphate and tannic acid (nicotine tannate) gave little control.

Lead arsenate formed the common basis of the most satisfactory spray mixtures.

Spray Injuries and Deposits.—Severe injury to foliage and fruit followed the use of a proprietary emulsion. (See Treatment No. 16.)

Tar distillate is a valuable dormant or winter spray as an ovicide for peach aphis. In a test with even a dilute tar distillate mixture with the lead arsenate spray as a codling insecticide, it was found to burn so severely as to preclude its use. (See Fig. 6.)

There appears to be an excessive drop of small fruit following the use of white oil plus a contact insecticide early in the season.

For the first time in five years' experience, the use of white oils in four or five cover sprays has resulted in a little injury to some of the fruit.

It is of interest that with regard to four trees of Delicious variety which received fifteen oil sprays in the past three seasons, these are apparently quite normal and healthy. In storage the fruit from these trees has remained in even better condition as regards freedom from rotting than similar fruit receiving lead arsenate and lime-casein only. However, in view of the slight burn with four or five applications of lead arsenate with white oil in Cleopatra, and even Rome Beauty and Stone Pippin trees, the recommendation is not to employ the oil with the lead arsenate in more than two or three spray applications in each season.

Some blotching, however, occurred on the highly-coloured fruit due to uneven deposits of lead arsenate retarding normal colouration.

In some plots a pronounced spray residue remained on the fruit at harvest time.

Some varietal difference in reaction to spray injury is indicated.

Dusting versus Spraying.—For the past season dusting with lead arsenate has, for the first time in five years' experience, compared favourably in control with spraying with lead arsenate alone, but was not so effective as the lead arsenate plus white oil spray.

Orchard Demonstration of Control.—The use of white oil emulsions with lead arsenate has given the most satisfactory field control.

Lime-sulphur in all cover sprays also enhanced the value of lead arsenate in control.

White oil alone did not give sufficient control, even when following several applications of lead arsenate alone.

Comparison with Experiment Plots.—The field areas, each of one acre, have confirmed the findings of the experimental plots, especially regarding the use of white oil emulsions and lime-sulphur.

Spray injuries were almost negligible in the field areas.

Chemical Treatment of Bandages.—Severe injury to the trunk has followed the use of bandages steeped in oil, even when the exposure was as short as six weeks. The use of oiled bandages is therefore not recommended, though the use of untreated bandages and the regular destruction of grubs is strongly advised.

Ovicides.—In laboratory experiments white oil combinations were found to be very good ovicides.

A new pyrethrum extract and a tar distillate were ineffective at the rates employed.

A combination of nicotine sulphate and tannic acid gave results comparable to those for nicotine sulphate alone in tests carried out the previous season.

Comparison of Batlow and Bathurst Strains of Codling Moth.—The seasonal life histories of these two strains were found (in laboratory experiments) to be very similar. Two practically complete broods and a partial third brood are indicated.

A colour variation of adult codling moths, viz., light copper instead of dark grey, was bred out from both the Bathurst and Batlow strains.

CONSERVING FODDERS ON THE SOUTH COAST.

MR. R. N. MAKIN, Senior Agricultural Instructor, who judged the South Coast fodder conservation competitions, draws attention to the general need among farmers in those parts for improved methods of protecting stored fodders. Particularly, he observes, should more protection be given to stored maize grain against not only the elements but also mice, rats, and even farm poultry. No farmer should be without a maize crib, which need not be an expensive structure to give ample protection.

Haystacks were generally well protected, but some farmers used dry maize stalks to cover pit silage prior to earthing up. This loose, coarse material permitted too much air to gain access, with consequent spoilage of the top layers of the stored fodder. Bags proved just as unsatisfactory when used as a covering.

The best covering for pit silage is some soft, succulent growth; and if weeds are available, as they often are in the autumn, they can be used to advantage. Mr. Makin even recommends the growing of a crop of Japanese millet for the purpose.

"HORTICULTURAL ABSTRACTS": A VALUABLE NEW JOURNAL.

THE publication of a quarterly abstract journal on all aspects of fruit production should be welcomed by horticulturists, particularly scientific workers, everywhere.

The aim of the Imperial Bureau of Fruit Production, East Malling, England, in publishing this journal is to collect under one cover summaries of the more important current horticultural literature, special emphasis being attached to fruit production, storage, and allied subjects. A specimen copy of the first issue has reached us from the Imperial Bureau, and we find the summaries quite lengthy enough to indicate fully the contents and scope of the papers dealt with. The work should prove of inestimable value in enabling workers to keep abreast of the times, particularly those who have a minimum of time to devote to reading. The subscription to this journal is only 1s. 6d. per number, or 5s. yearly, post free, obtainable from the Imperial Bureau of Fruit Production, East Malling, Kent, England.

IMPORTS AND EXPORTS OF FRUIT.

THE following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th September, 1931:—

Description.	Imports.	Exports.	Description.	Country of Origin.	Imports.	Exports.
			Oversea.			
Interstate.	Cases.	Cases.	Fresh Fruits—		Centals.	Centals
Fresh Fruit ..	347,551	78,953	Apples ..	....	...	2,694
Tomatoes ...	67,672	...	Bananas ...	....	68	38
Bananas	62,187	...	Lemons ...	....	...	3,751
	bunches.		Oranges ..	....	14	49,759
,, ...	503		Grape Fruit ...	....	3	173
	cases.		Pears	.. ..	...	158
Pineapples ...	57,042	...	Pineapples ...	....	...	3,025
Melons . ..	11	. .	Other	....	37	19,690
Strawberries ..	1,276	...	Dried Fruits—		lb.	lb.
	trays.		Apples ...	.. ..	...	3,350
,, ..	6,275	...	Apricots ...	....	...	7,830
	lb.	lb.	Currants ..	....	...	35,939
Canned Fruit ..	79,454	56	Peaches ...	... .	...	372
Dried Fruits—			Prunes ...	.. . .	. .	181,795
Unspecified ...	16,828	168	Raisins—			
Currants .	8,960	112	Sultanas ..	....	...	69,176
Raisins	9,996	56	Lexias ...	....	...	38,642
Apricots ...	672	...	Other ..	....	...	14,989
Apples ...	560	..	Dates	Mesopotamia ...	44,590	13,742
Peaches ..	840	...	Other	China	2,360	1,823
Pears	448		Preserved in liquid—			
Prunes ...	1,344	8,988	Apricots ...	... .	...	293,016
			Peaches ...	....	...	1,484,341
			Pears ..	....	...	5,069
			Pineapples ...	....	...	536
			Raspberries	....	...	122,446
					Gallons.	
			Other ...	... .	219	24,956

"THE CULTURE OF THE ORANGE AND ALLIED FRUITS."

H. CLARK POWELL's book, "The Culture of the Orange and Allied Fruits," is a valuable addition to the literature on citrus culture. Although the book deals with South African conditions, much that it contains is capable of interpretation in terms of Australian conditions, thus making it useful to the citrus grower in this country.

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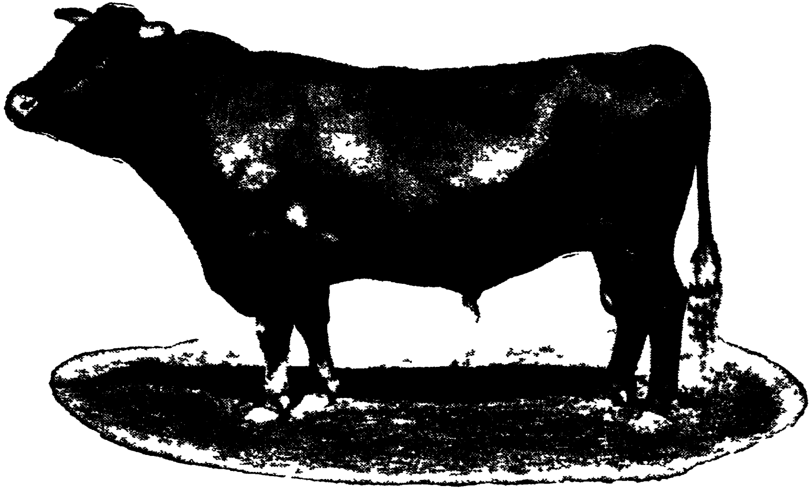

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[Stationed at Berry Experiment Farm]

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Orchard Notes.

DECEMBER.

C. G. SAVAGE and R. J. BENTON.

Re-working Citrus Trees.

UNDESIRABLE varieties of citrus trees that were headed back in early spring should now be making strong growths, and where the cutting back was done early enough the shoots should be large enough to bud. In almost all cases some thinning out of the shoots will be necessary in order to facilitate the actual operation of budding the selected shoots (six to ten in number). Where the shoot development is not large enough, budding may be deferred until February or March, but in any case the shoots which it is intended ultimately to bud will benefit from a thinning of growths now.

Thinning of shoots prior to budding should not be overdone, otherwise sunburning will result. Shortening back many of the shoots may be desirable in order to make a little shade and prevent dying back.

If buds are inserted now they should be forced into growth as soon as they have taken. This can be effected by cutting back to within a few inches of the bud. This immediate forcing of the buds is necessary in order to ensure proper development before winter. Buds inserted in the autumn are. of course, allowed to remain dormant until spring time.

Irrigation.

Depending on the weather and the condition of the soil, applications of water may be desirable during December. No hard and fast recommendation can be made, for cultivation methods and soils vary greatly. As a rule the less water applied the better.

Present indications point to a large citrus crop next season, and if such eventuates the principal demand will be for medium to large size oranges. Bearing in mind that many oranges grown under irrigation are usually too large, and, as soil moisture is the main controlling factor as regards size, the grower is in a position to regulate to some extent the size of his fruit by limiting the amount of irrigation. In localities that usually produce small fruit, the aim should be to increase the soil moisture, either by irrigating more freely or by conserving moisture by cultivation and mulching if necessary. Greater efforts should be made to produce a larger percentage of fruit of a size that finds most favour with consumers.

Renovating Weak Trees.

There are many hundreds of weak citrus trees to be seen in practically every citrus-growing centre. The weakness may be caused by excessively wet conditions, lack of fertility and sometimes pest infection. Weakness due to lack of fertility and pests can only be remedied by removing the cause of the trouble, but where the condition is due to excessive moisture many trees will pull through and again prove profitable if only good cultural practices are adopted, aided by a pruning back, either moderately or severely in accordance with the state of the tree. The ploughing in of as much organic matter as possible—old grass, leaves, &c.—is desirable in order to encourage new feeder root development. It is most unfortunate that many trees have suffered from excessive winter rains, but with assistance the majority will respond.

Scale Pests on Citrus.

During the next six weeks will be the most suitable time to treat white wax scale, which is very prevalent. In most localities January is the best month to spray, but growers should guard against postponing the treatment until too late to get a good kill. In any case it would be wise to order any spray oils, tents, fumigants, and other materials now, so that the work can be performed during favourable weather periods. If purchasing new fumigation tents or sheets, make sure they are made of good material, which should be very closely woven and of sufficient weight for the size of the cover. Any tents on hand should be overhauled.

Pruning Citrus Trees.

Some pruning, particularly of young citrus trees, may be necessary now or during the early autumn months. The chief aim should be to keep the centres of the trees reasonably open by preventing strong growths developing too near the tree's centre. Also shorten back any vigorous shoots which may be bending over too near the ground. Older trees may require a little lifting so as just to clear the ground.

Apricots.

Apricots will be fit for drying this month. The fruit should be fully eating ripe, but not mushy. Full directions for sulphuring this fruit so as to secure a good coloured product, and at the same time avoid having an excess of sulphur dioxide in the fruit, can be obtained from the Department of Agriculture in pamphlet form. A better coloured and conditioned article can be secured by drying in the shade. If a grape drying rack is available the trays of fruit can be placed on it. In this way the fruit is exposed to a free current of dry air, but is protected from the direct rays of the sun, and a more pliable and fleshy article will result.

Codling Moth.

Because there is an exceedingly light crop of apples and pears, growers will be apt to neglect control measures for codling moth. Of course, it is useless to spray trees carrying no crop at all, but care should be given to those trees that are carrying even a small amount of fruit, as this will help to reduce the carry-over of the trouble to next season. A leaflet dealing with codling moth control is obtainable free from the Department.

Marketing Stone Fruits.

Coastal growers of early peaches will be kept busy this month forwarding consignments to market. In order to secure the best results the trees should be gone over several times, each time picking only those fruits which have reached the right degree of maturity. The remaining immature ones are thus allowed to increase in size and improve in quality.

Stone fruits should be picked with extreme care; they should be firm, but properly matured, so that the natural ripening process will continue after removal from the tree. If the fruit is picked too green it will shrivel and be hard to dispose of.

Care should also be taken not to allow the fruit to become overripe, as some time elapses between a consignment leaving the orchard and reaching the consumer, and if it is over-mature when it sets out it has little chance of reaching the market in anything like good condition

When packing, see that grading for size and quality is honestly carried out, and that the cases are not packed too high, or the fruit forcibly squeezed into place. Packing fruit too low should also be guarded against.

Grafted Trees.

The ties on grafts should be left on as long as possible, but as soon as they commence to cut into the limb they should be removed. It is quite a common thing to see this point neglected, and as a consequence large numbers of grafts are lost, particularly when a bark graft has been used. When the grafts are inserted in the stock the material used for tying is bound round the limb very tightly, and as the graft grows there is no room for it to expand. The first reminder a grower gets that he has neglected to remove the ties is often an unpleasant one, particularly after a windy day, when he finds large numbers of grafts broken or blown off the trees.

A Standard Dip for Sultanas.

As a result of the investigations carried out by the Council for Scientific and Industrial Research in co-operation with the Departments of Agriculture in New South Wales, Victoria, and South Australia, the Australian Dried Fruit Association has decided to recommend the adoption of the mixed dip as the standard dip for the industry. Commercial results have shown conclusively that the adoption of a standard dip eliminates many of the variations that now cause dissatisfaction overseas, results in higher returns for the product, and facilitates disposal of the pack. The contention that the mixed dip is not suitable for certain districts and soils was not sustained by the investigations, in which uniform results were obtained in all districts.

Advantages of the Mixed Dip.

The advantages of the mixed dip may be summarised as follows:—

1. Dried fruit processed with the mixed dip approximates very closely that from the cold dip in colour and type, while giving a greater percentage of high-grade fruit in the total pack.

2. The drying period of the fruit from the mixed dip is practically similar to that of fruit from the modified temperature caustic dip, while the resultant grade and colour are much more suitable for present market requirements.

3. In comparison with the cold dip, the mixed dip has the follo advantages:—

(*a*) The drying period is shorter, with a greater possibility of fini off the fruit before bad weather occurs.

(*b*) The costs of the substances used in the dip are considerably le

(*c*) The green tinge is more easily removed.

(*d*) The racks are released for a second filling earlier in the season, with less deterioration of those grapes still on the vines, and consequently a better grade in the dry product from the second and subsequent fillings of the racks.

The Mixed Dip.

The ordinary types of dip tanks used in the industry for the caustic dips are suitable.

The method of preparation and the procedure in using mixed dip are:—

1. For 50 gallons water, use 2½ lb. potassium carbonate, in which 1½ pints olive oil are emulsified.

2. Add 1½ lb. caustic soda per 50 gallons of the mixture.

3. Heat to a temperature of 180 degrees Fahr. and test by dipping some of the sultanas. Add additional caustic soda (¼ lb. at a time) until slight cracks appear on the berries. The dip is then ready for use at 177 to 183 degrees Fahr. The dip should not be heated to higher temperatures when not in use.

4. Make all necessary additions to the volume of the dip by adding a solution prepared as in (1) above. (A stock solution prepared in a separate tank is found useful.) Additions in volume usually necessitate additions of caustic soda as in (3) above.

5. The appearance of the fruit should at all times be taken as a guide to the concentration of the caustic soda. If over-cracking, decrease concentration by adding solution as in (4) above. If under-cracking, add caustic soda (¼ lb. to 50 gallons) until cracks are in evidence.

To Ensure Quality.

Handling the Fruit.—Careful handling from vine to rack is essential. Damaged berries deteriorate on drying, and contribute to an inferiority in grade. Crushing of berries, by overfilling the buckets, is a common form of damage. Bunches with broken or wasted berries or mould may conveniently be picked out for drying separately as they come under notice during spreading. Thin even spreading is essential for quick and even drying.

The Fruit on the Rack.—Shading of the sunny side in very hot weather is recommended to prevent excessive browning. Should rainy weather occur, spraying with the cold dip solution is useful after the rain to prevent darkening and to hasten drying. The spray is prepared by dissolving 4 lb. carbonate of potash in 8 gallons water and adding half a cup of olive oil. Stir thoroughly and rapidly to form an emulsion. Fruit should not be removed from the rack until thoroughly dry, otherwise darkening of the berries and stickiness through breakages will result.

rea*oval from the Rack.*—Fruit when dry should be shaken from the rack thus morning, and spread thinly on hessian as soon as possible. Sticks, St[illegible]lles, &c., should not be used when removing the fruit from the rack, proper[illegible]ess results. As the massing of the fruit contributes to darkening, rem[illegible]ld not be left in heaps for longer than absolutely necessary after removal from the rack.

The Fruit on the Hessian.—The application of the cold dip spray is useful to facilitate colouring by the sun and gives a more even sample. The major cause of deterioration of fruit in boxes after packing is excessive moisture. This feature, which does not come directly under the notice of growers, is a frequent cause of reduced returns; therefore, fruit should be thoroughly dried before delivery to ensure keeping qualities.

The Maturity of the Grapes.—Many growers consider that late drying, giving additional weight, is of monetary value. This may have been true in former years when the differences in returns according to grades were slight, but it certainly does not apply under present conditions, when the differences in the returns to growers vary markedly with the grade. Anything that can be done, therefore, to hasten picking is an advantage, though, as in former years, the picking of unripe grapes results in a light unsugared sample and must be avoided.

Two very desirable practices that might well be taken up by a greater number of growers are:—

(*a*) The picking of sultanas in relation to currants:—

In certain seasons, as a result of unseasonable rains or very hot weather, a marked proportion of the currants wilt on the vines, and, unless harvested, may be lost. When such conditions arise, harvesting of currants prior to sultanas is justified. In the majority of seasons, however, the grade of currants is improved by leaving the fruit on the vines, while the reverse happens in the case of the sultanas. As in the majority of seasons (for example, 1931) the currants ripen little, if any, in advance of the sultanas, it is sound policy to pick at least portion of the sultana crop before harvesting the currants. A decision on this matter cannot be made prematurely, but every grower should give the matter careful consideration prior to harvest, when the nature of the season is disclosed.

(*b*) Irrigation in relation to harvesting:—

It is essential to preserve a satisfactory moisture content throughout harvest, otherwise wastage of the grapes on the vines occurs. For this reason, a pre-harvest irrigation is practised. It is sound policy, however, to withhold irrigation on at least portion of the sultana vineyard, which will then ripen earliest. An advance of the sultana harvest can be obtained in this way, with a consequent decrease in late picking, which is responsible for much of our poor quality sultanas.

As previously stated, the loss in weight resulting from early picking is slight in comparison with the higher returns obtained, and in addition the harvesting costs are decreased by quicker drying and less handling. The sultanas which did not receive a pre-harvest irrigation should be watered as soon as possible after harvest. Under present arrangements in the majority of settlements it is possible to irrigate in March for late grapes and citrus. The practice of irrigating and putting in the cover crops at this period on land from which the previous crops have been harvested is desirable and should be extended.

Cherry Aphis: A Notifiable Pest.

Attention is drawn to the fact that cherry aphis (*Myzus cerasi*) has been proclaimed a notifiable pest in all that area of land situated within the following boundaries: Commencing at the north-east corner of the State of New South Wales, and thence westerly along the boundary between the States of New South Wales and Queensland to the town of Goondiwindi, thence by a line southerly to the town of Merriwa, thence easterly to Cape Hawke on the sea coast, and by the sea coast northerly to the point of commencement.

It is therefore compulsory for the occupier of any land or premises in the above area, in which this pest appears, to notify in writing an inspector under the Plant Diseases Act, or the Under Secretary, Department of Agriculture, within twenty-four hours after first discovering or becoming aware of its presence.

Bunchy Top and Banana Beetle Borer

It is desired to impress upon banana-growers the necessity for taking proper measures, particularly during the summer months, to control bunchy top and beetle borer.

With the advent of warmer weather, growers are advised to be on the alert for any evidence of bunchy top in their plantations, and to treat and destroy the affected plants in accordance with the regulations. Records disclose that the disease has always proved to be more prevalent and a greater danger in the summer months. It is the intention of the Department strictly to enforce the regulations dealing with the control of both bunchy top and beetle borer, and the inspectors have therefore been notified to report immediately any cases of neglect on the part of growers.

As growers may not be as familiar with the more recently gazetted regulations regarding beetle borer as with those appertaining to bunchy top, it is pointed out that in the case of beetle borer infested plants all spent stems must be cut off at the ground level and each stem must forthwith be split longitudinally, the cut surfaces of the split stems to be dusted immediately with a mixture consisting of one part by weight of Paris green and twenty parts by weight of pollard or flour. All spent infested and uninfested corms must either be dug out and sliced into sections not exceeding 1 inch in thickness, or the cut surfaces of the corms at the ground level must be dusted with the abovementioned mixture.

As in the case of bunchy top, however, a person may keep a specified number of cattle on the land in lieu of carrying out the above treatment, provided he first of all obtains written permission to do so from an inspector under the Plant Diseases Act.

Vaccination Against Fowl Pox.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research, and
J. K. HUTCHISON, B.V.Sc., Veterinary Research Officer.

EARLY in 1929 it was decided to take up the question of vaccination against fowl pox, and following some preliminary trials with a limited number of birds at the Glenfield Veterinary Research Station a vaccine was evolved. This vaccine has now been subjected to field trials for two seasons, and the purpose of this note is to give in summary the result of these trials.

At the outset it may be explained that the aim is to vaccinate birds some time prior to the appearance of the natural disease, in order that they may by then have acquired a substantial immunity. Birds varying in age from eight to twenty-six weeks have been vaccinated, but the greater number was between twelve and eighteen weeks, this age being considered, as the result of earlier observations, to be the most suitable.

Results Substantially in Favour of Vaccination.

During the season 1929-30 a total of 5,127 fowls were vaccinated, 5,440 birds running on the same properties being observed as controls. These controls were in all cases running with the vaccinated birds, and thus both lots were equally liable to contract the natural disease. It so happened, however, that during this particular season there was comparatively little fowl pox, and thus the vaccine was not subjected to as rigorous a test as we would have desired. The results, however, were substantially in favour of vaccination, only 0.31 per cent. of the vaccinated birds developing fowl pox, whereas 8.49 per cent. of the controls contracted that disease

During the succeeding season, 1930-31, the field tests were extended, and a total of 13,005 pullets and cockerels were vaccinated on twenty-two properties. With these were run 5,605 non-vaccinated controls, whilst observations were also made on 10,660 other non-vaccinated birds, penned separately but running on the same properties.

A local reaction follows vaccination, and in most cases this has occurred in 95 per cent. of the birds vaccinated, but in one case was as low as 50 per cent. This reaction consists of the development of a small inflammatory area where the birds are vaccinated and the subsequent formation of a small scab on this site. Accompanying the local reaction, birds generally show a certain degree of systemic reaction. This lasts about four to six days, and occurs approximately three weeks after vaccination. It is characterised by slightly suppressed activity and a slight loss in appetite. The effect of vaccination on pullets in lay has been somewhat inconsistent, and varied from no effect at all to a temporary set-back in egg production. On one occasion the set-back was of the same degree but of shorter duration than that following a natural attack of fowl pox, but as these birds later showed a solid immunity the net effect of vaccination, taking egg production for the whole season into account, has been of benefit. In all other cases the set-back has been considerably milder or has not occurred at all. In pullets about to lay the commencement of production has been delayed for about two weeks. This is a feature which is regarded not unfavourably by poultry farmers, as the subsequent egg production is less spasmodic and fewer pullet-grade eggs are laid.

Don't Vaccinate Birds Suffering from Other Diseases.

Other diseases affecting the flock may possibly be influenced by vaccination, as immediately following this treatment the general resistance of the bird is somewhat lowered. In all cases, therefore, it is most desirable that careful watch be kept over birds immediately prior to vaccination, so that if any other complaint is present vaccination may be delayed. In most cases there has been no other disease affecting the birds vaccinated, but in a few cases, unfortunately, such has been present and has interfered to some extent with what were otherwise generally good results. In our first year's work a particularly severe outbreak of infectious oculo-nasal catarrh occurred in one flock immediately subseqnent to vaccination, and went through vaccinated and unvaccinated birds alike from pen to pen. It occurred in one pen of vaccinated birds during the third week after vaccination (when the vaccination reaction was at its height), and was particularly severe on this group. During our second season's work, however, we have been fortunate in that it has been possible in most cases to guard against vaccinating birds affected by another complaint, and thus intercurrent disease has not seriously influenced the results.

The mortality following vaccination has been no greater than that in the controls, except that on two properties there was a progressive mortality in the five months following vaccination, odd birds dying right through this time. The cause of this could not be elucidated satisfactorily, but we do not feel that vaccination was wholly to blame.

Development not Affected by Vaccination.

Development after vaccination has been completely satisfactory, except in those flocks where other disease was present and which itself interfered with proper development. On some properties a few vaccinated birds have shown lesions of fowl pox on the combs a short time after vaccination This was followed by a typical outbreak of fowl pox in the controls, but no marked affection in the vaccinated birds.

Following vaccination all birds have been kept under supervision until well after the last cases of fowl pox have occurred, *i.e.*, for a period of some *six to seven months*, and the protective value of vaccination is furnished by the following figures:—

12,516	vaccinated pullets	8·6	per cent. cases of fowl pox.
5,313	non-vaccinated pullets running with vaccinated birds	67·1	,, ,,
9,975	non-vaccinated pullets not run with vaccinated birds	40·9	,, ,,
489	*vaccinated cockerels*	4·5	,, ,,
292	*non-vaccinated cockerels running with vaccinated birds*	*26·7*	,, ,,
685	non-vaccinated cockerels not run with vaccinated birds	78·1	,, ,,

It will thus be seen that the results have been very substantially in favour of vaccination. Certainly there was some variation between individual properties, but in those cases where fowl pox did appear to any extent in the vaccinated birds it was noticeable that the disease was considerably milder than in those not vaccinated, thus demonstrating the benefit of vaccination. In one case a fairly high incidence was seen in vaccinated birds, and the possible reasons for this are being investigated.

Influence on Egg Production.

From the point of view of the poultry farmer fowl pox is of importance chiefly owing to its influence on egg production. It has not been possible to get figures from all properties, but where such have not been available owners have reported that protection from the disease has been accompanied by maintenance of egg production—the benefit of which poultry owners look for. Actual figures are available from four properties:—

Property A—	
1st Test Lot (period 4 months)—	
Vaccinated pullets	9,229 eggs.
Non-vaccinated pullets	6,114 ,,
2nd Test Lot (period 3 months)—	
Vaccinated pullets	6,365 ,,
Non-vaccinated pullets	5,838 ,,
Property B (period 5 months)—	
Vaccinated pullets	1,730 ,,
Non-vaccinated pullets	1,135 ,,
Property C (period 3½ months)—	
Vaccinated pullets	1,337 ,,
Non-vaccinated pullets	932 ,,
Property D (period 3 months)—	
132 pullets from 13 to 16 weeks old when vaccinated	2,384 ,,
139 pullets from 11 to 15 weeks old when vaccinated	768 ,,

In summary, therefore, we feel that the results, taken broadly, have been highly satisfactory indeed, both from the point of view of protection of the bird against fowl pox and from increased egg production, and it is intended, therefore, to extend the use of vaccine during the coming season. It is very important, however, that not only successes but apparent failures be brought to our notice, as with further *investigation it is confidently* hoped that more consistently satisfactory results may be obtained. It must be remembered, however, that even in other diseases where vaccines have been used with marked success for many years unaccountable "breaks" sometimes occur.

Notice to Poultry Farmers.

Poultry farmers desirous of availing themselves of this vaccine are advised:—

1. That vaccinations must be completed before 31st December, 1931.

2. That birds should be between ten and sixteen weeks of age, and it *follows, therefore,* that it may be necessary to undertake the vaccination of a complete flock in two or even three sections.

3. That in order that the value of vaccination may be accurately estimated it is desired that not more than half the birds on the property be so

treated. Vaccinated and non-vaccinated birds must not run together until at least six weeks after vaccination. If they can be kept separate during the fowl pox season such would be an advantage, as the influence of vaccination on egg production during this period can then be ascertained.

Early application, addressed to the Chief Veterinary Surgeon, Department of Agriculture, Sydney, is therefore desirable, and applicants should furnish the following information:—

(*a*) Total number of pullets and cockerels on property.
(*b*) Number it is desired to have vaccinated.
(*c*) Ages *on 30th September*, and number of each age group of the birds it is desired to have vaccinated.

WINTER GREEN FODDERS UNDER TRIAL AT GRAFTON.

THE results of last season's winter green fodder trials at Grafton Experiment Farm are of more than usual interest, owing to the very dry conditions that prevailed during the growing period, when only 4 inches of rain fell.

Plots of wheat, oats, and barley were tried out against combination plots of oats and wheat, oats and peas, and oats and vetches. Sowing took place on 7th and 8th May, 1931, and harvesting commenced on 13th August and finished on 24th September, the wheat being cut at flowering stage, the oats when it showed the full panicle out of the boot, and the barley when nicely out in head, but before the awns became hardened.

The combination plots gave the best results on the whole, the Buddah oats-Clarendon wheat plot topping the yields with 9 tons 6 cwt. per acre. The legumes in the combination plots held their own particularly well, and made very nutritious fodder. Of the single-crop plots, Florence wheat, with a yield of 9 tons 2 cwt., yielded best, Sunrise oats coming next with 8 tons 16 cwt. Since 1926 this latter variety has proved the most consistent yielder, and is taken as the standard in these trials. Other plots to yield well were:—Waratah wheat 8 tons 15 cwt., Mulga oats 8 tons 9 cwt., Buddah oats and field peas in combination 8 tons 4 cwt., Buddah oats and vetches 8 tons 4 cwt., Clarendon wheat 8 tons 3 cwt., while Karru barley, with a yield of 8 tons 1 cwt., proved the best of the barleys. All other crops tried yielded less than 8 tons per acre.

BIGGER PROFITS FROM BETTER COWS.

THE first result obtained from testing for production is the identification of low producers, enabling them to be culled out. The animals remaining in the herd are then better looked after and better fed. The result is that the smaller, culled herd of higher producers gives an aggregate annual yield equal to, and in most cases greater than, that given by the larger herd previously kept on the farm, and at a smaller labour cost. Again the farmer, having experienced the advantages arising from better feeding, devotes time and attention to providing conserved fodder to assist the pastures. This again increases the herd yield.—L. T. MACINNES, Director of Dairying.

Poultry Notes.

DECEMBER.

E. HADLINGTON, Poultry Expert.

Culling.

As this month progresses a gradual falling off in egg production may be expected, and attention should be turned towards culling out some of the second-year hens if necessary. To the inexperienced this work is somewhat of a problem and many are at a loss to know how to commence eliminating the non-paying hens. In this connection the first consideration is to ascertain what proportion of the hens is laying, and this can be done by checking the production from each pen over a period of about a week. If it is found that the egg yield from some pens is below 50 per cent. during that time it is advisable to commence culling. The first steps taken should be to pick out the birds that show coarseness, which is indicated by sunken eyes, wrinkled and feathery faces, and a heavy appearance generally. Those are the sorts that, even if they are laying, will not lay regularly, and no loss can be occasioned by marketing them. In fact, being mostly fat and heavy birds, they will realise a good price in the market if sold before the glut of hens commences.

The next class to be dealt with is that which includes those birds which do not look fresh and may perhaps be drying up in the comb. These should be handled for the purpose of ascertaining the width apart of the pelvic bones. If they are close together, or less than an inch apart, it may safely be assumed that the birds are not laying, but it is here that judgment must be exercised to determine whether the birds may be only temporarily off laying, due to some little disturbance to the general health or to a change of conditions. This applies particularly to the heavy breeds of which a number may be just recovering from broodiness. It is, therefore, as well to give the benefit of the doubt to any birds that have large, prominent eyes, a clean face and fine skull. Where possible any doubtful ones should be penned separately for a week or two to see if they show signs of coming on to lay again.

Any birds whose combs have commenced to shrivel up and have lost their pliability can be dispensed with, because they are probably about to break into a moult: and such early moulters do not usually come on to lay any earlier than those which moult much later in the season, or if they do they will not lay consistently.

Some of the best of layers, and those which will most likely continue to lay well into the autumn are those with bright red faces, alert and prominent eyes, and somewhat bald on the head. These can be seen at a glance and no mistake can be made in keeping them until they moult.

There may also be a few of the first-year birds which require culling and a similar procedure may be adopted, although it is as well to restrict activities to the coarse, heavy browed types and any which may have commenced to moult during this month.

Measurement Tests.

Although reference has been made to checking the width apart of the pelvic bones to prove whether a hen is off laying or not, it must be understood that this method cannot be depended upon to determine whether a hen is a good or bad layer, because, when a hen ceases to lay for any reason, the pelvic bones commence to close up and the whole abdomen contracts so that the distance between the breastbone and the pelvic bones is lessened. The skin of the abdomen also loses its softness and becomes wrinkled and toughened. The longer the bird is off laying the greater the contraction of the skin and pelvic bones.

If a hen goes broody and is allowed to stay on the nest a few days it will be found that the pelvic bones close up considerably, and consequently if reliance is placed on pelvic bone measurement alone, many hens which are only temporarily off laying may be sent to market. Furthermore, apart from the birds which have ceased to lay, there are many which do not at any time show much width between the pelvic bones, while not always have the best layers in a flock been found to have the widest space between these bones, nor even to possess the finest and most pliable bones.

Culling Pullets.

On no account should pullets be culled by these measurement tests, because by so doing many potentially good layers may be rejected, as there is much more variability in the bones of pullets than in older hens. Even were it possible to select the good from the bad layers among hens by such a system, it would be unwise to attempt culling pullets by this means because their laying fluctuates so much in the early stages, and they are not properly "set" until about twelve months old. Again towards the end of the summer many of the pullets, particularly Leghorns, break into a partial moult after laying for some time. This may happen within the short space of a week or two, and be accompanied by a general contraction of the abdomen, whereas some weeks later when the pullets come on to lay again their condition is completely changed. Taking these factors into consideration, it is obvious that it would be impossible to accept such measurement test as a sole guide, without the risk of discarding many birds which were merely not in laying condition at the time.

As a matter of fact, the only culling that should be necessary among a flock of well reared pullets is to eliminate any which show serious deformities, and probably a small percentage of coarse-headed birds and any weedy specimens. Here again care must be taken if culling is undertaken while some of the pullets are moulting, as the shrivelled-up condition of the moulters, both in comb and body, may lead the inexperienced culler to reject many which later on would fill out into birds of normal size.

Keeping Up Production.

Many poultry-farmers fail to realise that the question as to whether their birds will continue to lay satisfactorily during the season when eggs are dear or break into early moult depends very largely upon the proper management of both hens and pullets, particularly as regards feeding and housing.

In the matter of feeding, no sudden changes should be made either in the ration being fed or the method of feeding, as any change during the next few months may result in a premature moult, with consequent loss of production at the time when eggs are scarce and high in price. The time of feeding, too, should be as regular as possible, and the more skilful the feeding the better are the chances of production being maintained during the autumn.

During the hot weather it is often difficult to gauge the exact requirements of the birds, as frequently after a day or two of hot weather they will not eat much more than half the usual amount, and careful feeding is necessary to keep the layers up to the mark. When it is apparent that the day is going to be very hot it is a good practice, where mash is fed in the morning, to reduce it by nearly half, so that there is not so much risk of digestive trouble occurring through the birds drinking heavily after eating the mash, or through leaving portion of the morning feed and eating it later, perhaps after it has been exposed to the sun. At other times the birds should be given just as much food as they are able to clean up within an hour after feeding.

Give a Tonic.

After the period of heaviest production a tonic will help to keep the hens in a condition to continue laying, and for this purpose "Douglas mixture" is unequalled. It can easily be made up on the farm at a trifling cost:—Dissolve 4 oz. sulphate of iron and 4 oz. Epsom salts in a gallon of boiling water; let it cool and then add ½ oz. *dilute* sulphuric acid. The mixture should then be stored in a glass or earthenware vessel and labelled "Poison." The dosage is two tablespoonsful to each gallon of drinking water, and it should be given three to four times per week for a month.

Housing Faults.

If production is to be maintained during the late summer and autumn it is essential that no crowding should be allowed among either the hens or pullets. In this connection it should be seen that sufficient perching accommodation is provided and that the roosts are not less than 20 inches apart. As a guide to the roosting space necessary it may be laid down that 7 inches of perch should be allowed for each adult bird, or 30 feet for each fifty birds. In the case of pullets, however, the houses should not be stocked to capacity during the hot weather, owing to the habit pullets have of packing together, even though plenty of space is available on the perches.

An inspection of the layers should be made occasionally on hot nights to note whether the birds are crowded and consequently suffering unduly from the heat. If the perches should be too close together, the birds will swelter and the atmosphere become stuffy. Such conditions if allowed to continue will soon cause a falling off in production and result in a moult. It is important, too, that the house be provided with ample ventilation so as to make conditions as comfortable as possible for the birds.

Only by watching these points and giving the birds the best of conditions during the humid weather of the late summer can it be hoped to maintain egg production at a profitable level during the slack season

THE MARKETING OF HONEY AND BEESWAX.

HONEY traders and beekeepers in general should be interested in the "Report on the Marketing of Honey and Beeswax in England and Wales," recently issued by the Ministry of Agriculture, London. The position in England as regards honey is that, although the per capita consumption is very low, British beekeepers produce only about one-third of local requirements. Publicity and better marketing are the means suggested for an improvement of the industry, and this report contains suggestions that should greatly help in the achievement of those aims.

The report outlines the grading and marketing schemes in several countries, and makes suggestions regarding standard packages for honey, the use of which, it is claimed, should facilitate trade and lead to economies in the manufacture of containers. The composition and properties of honey, its classification, supply and demand on the English market, preparation for market, transport and storage, publicity, and a section on beeswax are other features of the report, which runs into ninety-two pages, illustrated. Persons interested in the industry in this country should find in it many valuable suggestions.

Our copy from H.M. Stationery Office, Westminster, London but it is understood that Messrs. Albert and Son, Ltd., 180 Murray street, Perth, W.A., can supply copies. The price in London is 6d., plus postage.

WHEN MARKETING FRUIT.

GROWERS must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one-sized fruit of even quality and even colour in a case and packing it so that it will carry without bruising, and, when opened up for sale, will show to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find when the returns for the sale of his fruit are to hand, that after paying expenses there is little, if anything, left. The expenses of marketing the fruit is practically the same in both cases.

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